WASO-12
R(8/82)

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

GUIDELINE TRANSMITTAL SHEET

GUIDELINE NUMBER	TITLE	RELEASE NO.
NPS-77	The Natural Resources Management Guideline	1
		AMENDMENT NO.
OFFICE OF ORIGIN Natural Resources (470)		DATE 5/16/91

Explanation of material transmitted:

This document is the first release of NPS-77, the Natural Resources Mangement Guideline.

This guideline is a comprehensive guideline on natural resource management, combining existing guidance with documentation of unwritten practices and procedures of NPS resource management, and guides the actions of park managers so that natural resource activities planned and initiated at field areas comply with federal law and regulation and the Dept. of the Interior and NPS policy.

Susan Cleveland

Acting **Chief, Administrative Services Division**

NATURAL RESOURCES MANAGEMENT GUIDELINE

NPS - 77



United States Department of the Interior

NATIONAL PARK SERVICE
P.O. BOX 37127
WASHINGTON, D.C. 20013-7127

IN REPLY REFER TO:

Memorandum

To: Directorate and Field Directorate
Park Superintendents
WASO Division and Office Chiefs

From: Associate Director, Natural Resources

Subject: NPS-77, Natural Resources Management Guideline

I am pleased to transmit to you NPS-77, the Natural Resources Management Guideline, the Service's first comprehensive guideline on natural resources management. The guideline combines existing guidance with documentation of previously unwritten practices and procedures of NPS natural resources management. It provides, in one place, the information necessary to design, implement, and evaluate a comprehensive natural resources management program.

I urge you to see that the guideline is made available to the individuals in your office who have responsibilities relating to natural resources management. NPS-77, together with the Service's Management Policies, should be considered the fundamental references for our natural resources management program.

This guideline is scheduled for regular formal updates, the first occurring in 1994. In addition, comments or suggestions are welcome at any time and should be sent to the Wildlife and Vegetation Division, National Park Service, P.O. Box 37217, MS 490, Washington, D.C. 20013-7127. Printed binders for the guideline will be sent separately.

This monumental task could not have been accomplished without the dedicated efforts of individuals throughout the Service. I greatly appreciate the contributions of all those involved in the development of this guideline.

J. Eugene Hester

Attachment

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CHAPTER ONE: INTRODUCTION

INTRODUCTION

AUTHORITIES

The National Park System is comprised of more than 350 individual units administered by the National Park Service (NPS) for their intrinsic natural, cultural, and recreational values. There are three laws that constitute the primary authorities for administration of the National Park System. Under the 1916 NPS Organic Act, the NPS is charged with management of the parks to "... **conserve the scenery and the natural** and historic **objects and the wild life therein** and to provide for the enjoyment of the same in such manner and **by such means as will leave them unimpaired** for the enjoyment of future generations." (emphasis added)

The General Authorities Act of 1970 defined the National Park System as including all the areas administered by the NPS "...for park, monument, historic, parkway, recreational, or other purposes," and declared that all units in the System will be managed in accordance with their respective individual statutory directives, in addition to the Congressional direction found in the Organic Act and other relevant legislation, providing the general legislation does not conflict with specific provisions.

In 1978, in an act expanding Redwood National Park, NPS general authorities were further amended to specifically mandate that all park units be managed and protected "in light of the high public value and integrity of the National Park System" and that no activities should be undertaken "in derogation of the values and purposes for which these various areas have been established," except where specifically authorized by law.

PURPOSE AND OBJECTIVES OF THE NPS NATURAL RESOURCE MANAGEMENT PROGRAM

Natural resources are composed of inherently complex organisms, processes, and systems. The natural resource policies of the NPS emphasize the need to manage natural resources and values of the parks in a systematic, consistent, and professional manner. These resources and values include ecosystems and their component plants, animals, water, air, soils, topographic features, geologic features, and paleontologic resources, and aesthetic values, such as scenic vistas, natural quiet, and clear night skies. Natural processes and systems are dynamic, are often beyond immediate human control, and are affected by activities both within and outside of NPS units.

Understanding of these processes and systems is far from complete, yet the NPS is charged with management and protection of the natural resources of NPS areas into the future. The fundamental objectives of NPS natural resource management, as prescribed in policy, are to manage the natural resources of the National Park System to maintain, restore, and perpetuate their inherent integrity and, when consistent with the foregoing, to provide opportunities for visitors to

benefit from and enjoy natural environments which are evolving through natural processes minimally influenced by human action.

Within each park, management of natural resources (as defined below) is based on the park's management zones, as established in the approved general management plan. In **natural zones**, the primary objective of management is to protect the natural resources and values in as natural a condition as possible, while allowing for their enjoyment by current generations and ensuring their availability for future generations. In **cultural zones**, the primary management objective is to protect and foster appreciation of the cultural resources; natural resource management actions are designed to support cultural resource management objectives (e.g., maintenance of a historic landscape). While cultural resource objectives take precedence over natural resource objectives, natural resource policies are to be followed wherever they are compatible with cultural resource objectives.

Park development zones are managed for intensive visitor uses which may, by definition, require manipulation or alteration of the natural resources present. However, such manipulation should be limited to the minimum needed to support the intended use. In addition, where development zones are adjacent to natural zones, management should be geared to maintaining as natural an environment as possible, and to minimize adverse impacts on the natural zone. By definition, **special use zones** are managed and used for activities not appropriate in the other zones, such as commercial uses, or authorized mineral development activities.

Natural resource management is the function by which the NPS strives to understand natural processes and human induced effects; mitigate the potential and realized effects; monitor for ongoing or future trends; protect existing natural organisms, species, populations, communities, systems, and processes; and interpret these organisms, systems, and processes to the park visitor. This function can be broken down into six major activities:

Research Research is investigation aimed at the discovery and interpretation of facts, the revision of accepted theories in light of new facts, or the development of practical applications of such new revised theories.

Through systematic research the NPS better understands the natural resources and processes it manages. National Park System units serve as vital laboratories for non-destructive research that provides NPS managers, the scientific community, and the general public with greater insight into methods for the long-term management and protection of natural resources.

Mitigation Mitigation is the maintenance of the existing form and integrity of natural systems or system components, consistent with park management objectives, in the face of harm or potential harm from human activities within or outside the park. Mitigation is also the conversion of a resource, altered by human activity, to a more functional or natural state consistent with management objectives. As such, mitigation encompasses preservation and restoration activities.

Monitoring Monitoring is the systematic collection and analysis of resource data at regular intervals, in perpetuity, to predict or detect natural and human-induced changes, and to provide the basis for appropriate management response. Inventory is the process of acquiring, managing, and analyzing information on park resources, including but not limited to the presence, distribution, and condition of plants, animals, soils, water, air, natural features, biotic communities, and natural processes.

The collection of baseline inventory information on natural resources and the initiation of long-term monitoring programs to alert management to changes in resource condition is an essential part of the natural resource management program. Monitoring of key indicator resources provides an early warning system to management so additional research and/or mitigation can be initiated. Monitoring may also include developing representative collections of park resources.

Protection Protection is the prevention of overuse, vandalism, or destruction of natural resources by man-made causes and the enforcement of laws and regulations affecting natural resource management. Protection includes ranger patrols required to protect park natural resources, special permitting, and enforcement of regulations and/or laws pertaining to fish and wildlife species, endangered species, agriculture, grazing, minerals management, air and water quality, etc.

The NPS has been given a variety of legal and administrative tools through which natural resources can be protected. These include specific jurisdictional authority, legislation (e.g., Clean Air Act, Endangered Species Act), regulations, court decisions, negotiations, and cooperative agreements. Understanding and use of these tools in the protection of natural resources is essential to long-term preservation.

Interpretation Communicating to park visitors the nature and significance of park natural resources and processes not only increases the visitor's enjoyment of the park and its resources, but also encourages public involvement in the protection of natural resources.

Administration The administration of park resource management programs involves planning, priority setting, allocation of funding and staffing resources, contracting, training, and other activities which help support the substantive resource management activities described above.

DEFINITIONS

Natural resources Defined in NPS Management Policies as those features and values including native plants and animals, water, air, soils, topographic features, geologic features, paleontologic resources, natural quiet, and clear night skies. As a point of reference, **natural conditions** are defined as those that would have existed today in the absence of the effects of European man.

Park (or NPS unit) Used generically throughout this Guideline when referring to an individual component of the National Park System.

Resource manager Used generically throughout this Guideline when referring to those individuals directly responsible for planning and carrying out a park's natural resource management program.

Scientist Used generically throughout this Guideline when referring to those individuals responsible for conducting research relating to a park's natural resources.

Superintendent Used generically throughout this Guideline when referring primarily to park superintendents, site managers, or equivalent positions.

RELATIONSHIP TO OTHER GUIDANCE

NPS Management Policies constitutes the basic Servicewide policy document and, as such, provides the overall foundation for management actions within the Service. Management Policies is updated on a periodic basis (most recently in 1988) to reflect new or revised Servicewide policy decisions. The NPS guideline series provides more detailed direction to NPS employees to implement policy consistently on a Servicewide basis. Guidelines are mandatory where so written.

This document is the Service's first comprehensive guideline on natural resource management. Its purpose is to guide the actions of park managers so that natural resource management activities planned and initiated at field areas comply with federal law and regulation and Department of the Interior and NPS policy. The Guideline combines existing guidance (instructional memoranda, published operational statements, legal interpretations, etc.) with some of the first formal documentation of the unwritten practices and procedures of NPS natural resource management to form a single reference volume. As such, it imposes few new procedures, requirements, or restrictions but rather places the full body of NPS legal requirements, management policies, and procedural directives into the hands of professional resource managers and superintendents. It also provides, in one place, the framework on which a park may design, implement, and evaluate a comprehensive natural resource management program.

The management of natural resources is neither limited to "natural" areas nor is it an activity solely the responsibility of "natural resource managers." Therefore, this Guideline should be considered applicable to all NPS employees. Consequently, this document must be used in conjunction with other policy and procedural documents. Proposals, plans, or activities being developed by all program offices (such as enforcement, interpretation, maintenance, or administration) also should be in accord with the applicable sections of this Guideline. Applicable NPS guidelines, directives, technical handbooks, and other guidance are described within each individual section of this Guideline. As noted above, the latest version of NPS Management Policies should be considered the primary reference for all questions concerning basic Servicewide policy.

ORGANIZATION OF THIS GUIDELINE

Users of this Guideline should be aware of certain of its features. The level of detail of individual sections depends on the inherent complexity of a topic and the guidance already available on it.

Thus, certain sections are quite long and others are short, simply summarizing and referring to other guidance. In addition, some sections include a list of selected references on the topic. Other sections, for which appropriate, NPS-oriented references are not available, do not include such a list.

Each section, as much as possible, is meant to be self-contained. This results in some redundancy, for example, the placement of definitions in the sections to which they apply rather than in a single glossary. Whenever possible, the reader is referred to other sections of the Guideline which also relate to a particular topic. Some definitions apply only to a specific section.

The Guideline is organized according to traditional resource categories, such as air and vegetation. Therefore, certain important themes such as maintenance of biodiversity and ecosystem management, which could have been treated separately, underlie and cut across many sections and are addressed throughout the document.

The Guideline is organized into chapters on: resource management, resource uses, planning, and program administration and management. In most cases, individual sections within each chapter follow a standard outline, with the exception of selected shorter sections which primarily refer the reader to other existing guidance.

Where sections include exhibits it should be noted that these are meant to provide examples of certain reports, forms, and other information and should not be used in place of actual, official reports or forms.

For most sections, information is provided on specific roles and responsibilities pertaining to the parks, regional offices, and Washington offices for the subject being addressed. Guideline readers should be cognizant of the overall Washington Office responsibilities which apply generally to all natural resources issues: policy formulation, national level program design and management on key issues, technical assistance to parks and regions, and liaison with the Congress and the other federal agencies. These general responsibilities are not delineated within each individual section.

There are four divisions under the Associate Director, Natural Resources. The **Air Quality Division** is responsible for park air quality monitoring, review of proposed major emitting sources that may affect park resources, meteorological and atmospheric dispersion modeling, identification of and research on biological effects of air pollution, acid precipitation research, and other regulatory, environmental review, planning, legislative, and policy responsibilities relating to park air quality. The **Geographic Information Systems Division** is responsible for Servicewide policy development (including standards and guidelines), technical support in remote sensing and geographic information systems, and development and support of GIS and remote sensing software for NPS applications. The **Water Resources Division** is responsible for Servicewide policy development, research, and technical assistance in water resources management and planning, identification and mitigation of external and internal influences on park water quality and quantity, location and testing of surface and ground water sources, floodplain and flood hazard delineation, and inventory and quantification

of water rights. The **Wildlife and Vegetation Division** is responsible for Servicewide programs in wildlife and vegetation research and management, including endangered species, exotic species, consumptive uses, pest management, biological diversity, global climate change, Man and the Biosphere, and National Natural Landmarks. More specific Washington roles are described in individual sections of this Guideline where applicable.

Interpretation responsibilities are not usually delineated under Roles and Responsibilities. It is recognized that interpretation helps to make any kind of natural resource management successful by promoting public understanding and support of it. Specific roles of interpretation, however, are described where applicable.

Recommendations for amendments to this Guideline may be provided to the Associate Director, Natural Resources. At least every three years, the Associate Director will convene a work group composed of field and Washington Office representatives to review the entire Guideline and to make necessary updates and revisions. All formal updates and revisions will be first provided for review on a Servicewide basis.

CHAPTER TWO: NATURAL RESOURCES MANAGEMENT

VEGETATION MANAGEMENT
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VEGETATION MANAGEMENT

The purposes of vegetation management are as diverse as the National Park System itself, ranging from perpetuating natural processes in natural zones to conserving the historic values of cultural zones and accomplishing a variety of objectives in development and special use zones. This section is written with this diversity of management zones in mind. It begins with general guidance on the basic principles of vegetation management. Then it provides guidance on the two most important steps in any resource management program: how to clearly define the management objectives and how to develop an ecologically sound strategy for achieving those objectives.

DEFINITIONS

Biological diversity The variety of life and the processes that govern life. There are four major components of biological diversity: **genetic**--variation of genes within a species; **species**--variation of the kinds of plants and animals; **community/eco-system**--variation of the ways in which the many species of plants and animals aggregate into interacting groups; and **process**--variation in the physical, chemical, and biological forces to which genes, species, communities, and ecosystems respond.

Ecosystem A system of living organisms that interact with the environment and each other. Ecosystems are arbitrarily defined within certain boundaries; materials and energy cross the boundary in both directions as well as circulate within the boundaries. All vegetation management must account for the significant factors of the ecosystem (interactions with other species and environment) to be successful.

Genotype The genetic composition of an individual plant.

Landscape (Noun) A group of ecosystems and the interrelationships that connect them in a fairly large geographical area. Most NPS units are parts of larger landscapes. On a smaller scale, a landscape may also be the area immediately around a building or on the grounds of a site of particular interest such as a historical site. Vegetation management must keep the landscape setting in mind at all times. For cultural zones, there are specific terms for landscape types and treatments in NPS-28, the Cultural Resources Management guideline.

Landscape (Verb) To place plants and other materials and manipulate topography to achieve a desired effect. This is a form of vegetation management.

Plant community A group of plants growing in an interrelated manner on a particular site. Important attributes of a plant community are its species composition, the spatial arrangement of individuals, and interactions among the members and with their environment. This term is usually used in reference to both natural and cultural plant communities, although some ecologists and texts still use this term exclusively for natural communities.

Population A group of individuals of a species that are geographically close enough together to share a common gene pool, i.e., that can and do interbreed.

Restoration A process to replace existing vegetation on a site with desired vegetation that existed there before. **Revegetation** is usually used when plant cover is destroyed and then replaced. These two terms are often used interchangeably in the field of vegetation management. Therefore, it is necessary to ensure that the contract specifications literally spell out what is permitted and what is not permitted on NPS property. Specifications should include pest identification, monitoring on a regular basis, no pesticide application unless thresholds are reached (thresholds should be agreed upon prior to signing the contract).

Target community or target vegetation The group of plant species as well as the number and spacing of individuals of each species that constitutes the desired plant community. A project could involve several plant communities, constituting a target vegetation. The terms apply to both natural and cultural vegetation.

Vegetation The collection of plant communities distributed across the landscape. This is a technical term, not to be confused with the more general usage as an indefinite synonym for plants.

POLICY AND PROGRAM OBJECTIVES

NPS Management Policies states:

> The National Park Service will seek to perpetuate native plant life as part of natural ecosystems. Landscapes and plants may be manipulated only when necessary to achieve appropriate management objectives. These objectives will vary according to management zones. To the maximum extent possible, plantings in all zones will consist of species that are native to the park or that are historically appropriate for the period or event commemorated. Only native species will be allowed in natural zones. Use of exotic species in other zones will conform to the exotic species policy. In any zone, landscapes and plants may be manipulated to maintain habitat for threatened or endangered species, but in natural zones only native plants may be used if additional plantings are done, and manipulation of existing plants will be carried out in a manner designed to restore or enhance the functioning of the plant and animal community of which the endangered species is a natural part. (4:8)

AUTHORITIES

See the discussion of general authorities in Chapter 1. Additional authorities include the Endangered Species Act.

The gathering of fruits, berries, and nuts for personal use or consumption is covered in 36 CFR 2.1(c)(1).

Cultural landscapes are also afforded protection under several laws relating to historic preservation, including the Historic Sites Act of 1935 and the National Historic Preservation Act of 1966.

In addition, various state and county laws on noxious weeds and right-of-ways may be relevant to NPS vegetation management practices.

RELATIONSHIP TO OTHER GUIDANCE

References to vegetation management are included in a number of existing NPS guidelines including NPS-2, the Planning Process guideline (management zoning); NPS-12, the Environmental Compliance guideline (impact assessment and mitigation); NPS-18, the Fire Management guideline (prescribed fire use); NPS-28, the Cultural Resources Management guideline (for cultural landscapes and other historic, archeological, and ethnographic resources); NPS-53, the Special Park Uses guideline (agricultural and special use management); and NPS-75, the Inventory and Monitoring guideline (in preparation).

In this Guideline, see also Chapter 2, Soil Resources Management, Endangered, Threatened and Rare Species Management, Integrated Pest Management, Exotic Species Management, and Public Health and Safety; Chapter 3, Grazing and Agricultural Uses; and Chapter 5, Inventory and Monitoring.

A number of other NPS publications are also useful in developing vegetation management initiatives. A partial listing includes: Biotic Cultural Resources: Management Considerations for Historic Districts (Southeast Region); Earthworks Landscape Management Manual (Mid-Atlantic Region); Evaluation of Servicewide Reclamation Techniques for NPS Units (Technical Information Center, Denver Service Center); and Park Landscape Maintenance Handbook (National Capital Region).

Existing park management plans such as the statement for management, general management plan, resource management plan, and action plans for specific vegetation issues, such as fire management, cultural landscapes, hazardous trees, and vista management, should also be consulted.

Collecting biological specimens for scientific purposes must be authorized by the park superintendent in accordance with requirements in 36 CFR 2.50. The mechanism for scientific sample collections is the Specimen Collection permit, covered in 36 CFR 2.5 and NPS-53, the Special Park Uses guideline. See also, Chapter 5, Collections, in this Guideline.

PROGRAM GUIDANCE

I. Principles

Vegetation management is the maintenance, establishment, or restoration of target vegetation that meets a park's management objectives. The target vegetation can be quite varied. For example, it can include native plant communities in natural zones, ethnographically significant sacred plants, historically appropriate plantings in certain cultural zones, an agricultural crop in certain special use zones, or a modern landscape design in developed zones. If the park management objective is to preserve a dynamic ecosystem, then the management program might, in some cases, consist of doing nothing except monitoring ecological processes or, in other cases, taking steps to prevent certain avoidable human disturbances detrimental to the natural functioning of the plant community. If the objective is to preserve a historic point in time, then periodic intervention may be required to counteract natural successional processes. In either case, some understanding of natural, ecological processes at the site is necessary to effectively design a management strategy.

A. Genetic Resources

To the extent possible, consistent with management objectives, genetic integrity should be preserved. In a world of shrinking biodiversity, areas administered by the NPS may hold some of the nation's best remaining examples of natural biodiversity. NPS areas also contain some of the last of several cultivars.

Genetic resource management alternatives can be classified into one of three categories. (In the following sentences the term "genotype" refers to the genetic composition of an individual plant.)

1. **Preservation of genetic diversity** is the preservation of the full range of genotypes present within the area of consideration.

2. **Preservation of genetic integrity** is the preservation of not only the full range of genotypes but also the natural proportions of, and the natural interactions between, genotypes. The preservation of these interactions requires that plants be distributed in natural spatial patterns and have available the natural pollination and dispersal mechanisms.

   A plant community contains one to many populations of each species. These moderately well defined populations arise as a result of the interaction of heterogenous environments. The result is a mosaic of genetically different populations, even though they are morphologically identical.

   Complete preservation of genetic integrity would be achieved when no genotype is introduced to a point on the ground to which it probably would not have immigrated under natural circumstances, and when the proportional mix of genotypes does not

differ from what would have occurred under natural circumstances. In the process of revegetation or restoration, this condition is unachievable but we can strive to come as close as possible. Management actions can bring us closer or take us further from this state.

From a cultural landscape perspective, genetic integrity would be achieved when no genetic material (pollen) from another cultivar of the same species is allowed to cross with the extant cultivar where sexual reproduction is an important factor.

3. **Genetic contamination** is the introduction into a natural zone of genotypes not native to the local area. Introduction of the same species from a different ecological niche is genetic contamination. However, the genetic resources of a park may include historic cultivars that are no longer common and are of historical interest. Some introduced species may have been present on site for centuries and have considerable historic interest. Therefore, the NPS should promote the preservation of this genetic material, particularly genotypes of historically significant plants.

B. Attributes of Plant Communities

Plant communities always have four and, in some cases, five attributes that should be considered when designing a management program:

1. the species present,
2. the frequency of types and density of plants,
3. existing interactions among species present,
4. ecological compatibility with existing site conditions, and
5. historic/cultural importance.

Associated with the target vegetation is a list of appropriate species for the different communities noting the kinds of plants called for by management objectives. In the case of complex, natural ecosystems the list might be long and to some degree incomplete. In the case of a cemetery lawn, the list might be short. The species on the list may be native or introduced (non-native), depending on the management objectives. One would expect to find mostly native species in a natural area and perhaps mostly introduced species on the cemetery lawn. In the case of a designed historic landscape, the historically appropriate plants may be specifically described by the landscape designer or by other archival material.

If natural interactions, both physiological and genetic (repro-ductive), are to occur among plants of natural zones, then a spatial relationship that mimics what occurs in nature is necessary during

restoration. In contrast, the spacing of plants of cultural zones, such as designed historic landscapes, would be determined by the historical planting pattern specific to the site.

Each species on the target community list should be ecologically compatible with existing site conditions and the management objectives. In part, ecological compatibility determines the management effort required to establish and maintain a particular species. For example, a Kentucky bluegrass lawn grown in the arid West requires regular irrigation; a species more adapted to dry conditions, such as buffalo grass, may not require such intervention. Another aspect of ecological compatibility has to do with the extent to which the interactions defined by management objectives deviate from those to which the species is naturally adapted. For example, while buffalo grass may grow naturally in arid climates, it does not typically grow in dense, uniform stands where close proximity would result in competition for available water. Ecological compatibility has direct implications for management. The more incompatible a species or the more incompatible the interaction to be imposed, the higher the management cost to maintain the desired condition.

C. A Classification of Vegetation Management Alternatives

Vegetation management alternatives are described here in terms of three related goals: a) species complement, b) degree of natural interaction, and c) the degree to which the target vegetation is to represent a fixed time period or scene.

The species complement can range from "totally native" to "totally non-native." A plant list for a high quality natural area would consist entirely of native species, whereas a lawn probably would contain only introduced species. An historic site with a mix of natural and introduced species would represent an intermediate condition.

The degree to which natural interaction will be preserved can range from management actions that impose an interaction to management action or lack of it that permits natural interactions to be preserved. The degree to which the target vegetation is to be fixed in time would range from totally natural (maintained in a dynamic condition and allowed to respond to succession and climate change) to a fixed condition with respect to species composition and appearance.

The general orientation of management objectives within these three types of goals can be approximately described using such language as "non-native, fixed, with imposed interaction" or "native, dynamic, with natural interaction." By classifying vegetation objectives in this way, it will be more likely that the appropriate program will be developed to achieve the desired result. In addition, ecological compatibility for the selected alternative will determine the extent of management effort required to achieve the stated goal.

Some examples will illustrate the use of this model:

1. A cemetery lawn composed of Kentucky bluegrass turf.

   Since Kentucky bluegrass is an exotic species, the target vegetation is totally non-native. Assuming that no successional development is permitted, such as allowing encroachment by crabgrass or broadleaved herbs, the nature of the target vegetation will be fixed in time as an early successional community. Assuming that natural interaction (physiological) will be altered by mowing, watering, fertilizing, and elimination of other species, the target vegetation experiences a totally imposed interaction. The result is a non-native, fixed, imposed-interaction vegetation. In addition, if ecological compatibility is low because the bluegrass is to be established in an arid climate, management effort (watering, etc.) will be high.

2. Alpine tundra

   It is decided that a fellfield community will be established on a steep, windblown slope needing restoration. Plants will be allowed to immigrate naturally; the site will be protected from further avoidable human disturbance. The community will be allowed to change over time. The classification in this case is native, dynamic, natural interaction. Both physiological and genetic interaction is natural in this case because vegetation will become established in natural spatial patterns based on the local gene pool and natural plant establishment processes. The ecological compatibility of this objective is high because site conditions match the physiological requirements and genetic adaptations of the plants in the target vegetation. Management effort will be low.

The ability to professionally manage vegetation is directly related to the technical understanding of the resource and to the ability to unambiguously communicate management objectives. Precise communication will reduce misunderstanding and will make the sharing of improved restoration methods and management efforts more efficient. The more precisely management objectives can be stated, the more likely the management goal will be accepted and the anticipated results will be achieved.

Currently, the terms restoration, rehabilitation, and vegetation management often are applied interchangeably to a wide range of activities and results. For the purposes of this section, vegetation management is a broad term that encompasses all of maintenance (keeping vegetation as it is), restoration (returning vegetation to a former condition), and alteration (changing vegetation to a new condition). Also see NPS-28 for definitions of "restoration" and "rehabilitation" in relation to cultural landscapes.

Many sites require an application (and sometimes compromise) of goals in both the natural and cultural resource programs. Managers may need to read both sets of guidelines when dealing with landscapes that have experienced human use over time.

II. Determining Target Communities

To determine what the target community or vegetation should be, two major factors must be thoroughly considered and reconciled: a) the management objective for the site in question and b) the compatibility of the natural and cultural environment of the site with the management objective. The target community will usually not be the same for a whole management zone but will differ in relation to differing site characteristics. In fact, many projects like a road or sewer line could traverse many different local environmental conditions and require a different target community for each condition. For these reasons, a good site type map is a great help in planning efforts.

The purposes served by the establishment of vegetation are highly varied. These purposes may include preserving a certain scene, protecting against soil erosion, providing habitat for animals, preserving natural conditions, designing or enhancing a landscape for visitor use, interpretation, and/or administrative purposes, or preserving significant ethnographics resources. Each of these and the many other purposes, alone or in various combinations, constitute the management objectives for the vegetation. The target vegetation must be designed to accomplish the stated purpose.

Initial planning efforts to develop the right species lists for the various sites will pay great dividends in the future by increasing the success of the project and decreasing the amount of maintenance needed. A careful look at native communities surrounding the project area will help illuminate the conditions. If no ponderosa pines are found in the vicinity it would probably not be a good idea to plant ponderosa pine just because they would look pretty and did well at another site.

III. Vegetation Management Program

A. Assessment of Environmental Conditions

One of the first steps in formulating a vegetation management program is to assess the biotic and abiotic processes influencing the vegetation. General information describing park resources should exist in the general management plan or resource management plan. An assessment of environmental conditions for vegetation management purposes builds on the generalized information contained in these plans, and focuses on those critical conditions important for decision-making. It should be neither an encyclopedia of the resources nor simply a more detailed description of the influencing conditions. Rather, the assessment should analyze and interpret the specific conditions that have a significant role in determining the vegetation. In addition, since environmental conditions outside the park may influence the vegetation inside the park, the assessment should not be limited to the park. Land practices surrounding parks that have or may have negative impacts on park vegetation should be identified and a system designed to deal with the effects.

The following checklist highlights some of the common environmental conditions that should be considered when selecting those that are significant in the assessment. This list can be used for specific projects as well as for broader planning.

Geology/Topography

1. bedrock
2. geologic activity that is likely to be recurring
3. slope, aspect, and elevation; potential for slope failure
4. relief

Soils

1. Soil physical conditions--permeability, compaction infiltration, shrink-swell potential, pore space, particle size, solifluction, water holding capacity, erosion hazard, crusting
2. Soil chemistry--fertility, pH, organic matter content, cation exchange capacity, base exchange capacity
3. Soil type--soil texture, structure, tilth
4. Nature and thickness of rooting zone--organic layer, water holding capacity, solum thickness, soil biota, depth to permafrost

Climate

1. temperature--maximum, minimum, average, seasonal changes
2. precipitation--rain and snowfall by month, contribution of fog drip, daily duration of fog
3. wind--direction, speed, duration, seasonal changes
4. light--intensity, duration, cloud cover

Vegetation

1. species composition--past, present, target
2. genetic resources
3. exotic plants--including history of introduction and spread and effects on natural ecosystems
4. rare, threatened, endangered species
5. biotic and abiotic influences on community composition including fire, disease
6. community structure--stem density, size class distribution, biomass, spacing
7. dispersal vectors and pollinators
8. condition--vigor, diseases, insects, grazing, nutrient limitations

Air quality

1. types and seasonality/duration of pollutants entering park
2. effects on park vegetation--known, possible

Water quality

1. types and seasonality/duration of pollution
2. effects on park vegetation--known, possible

Hydrology

1. depth to groundwater, including annual variability
2. timing and characteristics of surface water
3. snow pack duration, thickness, melt characteristics
4. P/E ratio

Fauna

1. species composition
2. habitat requirements compared with existing habitats
3. rare, threatened, or endangered species
4. exotic species
5. effects on vegetation--pollination, utilization, trampling, soil compaction

Land use - within and adjacent to park

1. past--prehistoric and historic uses, specific locations and conditions of that use
2. present--existing management zones, developments, visitor use patterns, and ethnographic uses
3. future--general management plan proposals, local government zoning and land plans
4. historic and contemporary Native American uses of vegetation

Cultural and Aesthetic resources

1. cultural resources--location
2. scenic or aesthetic features

B. Vegetation Management Plan

Vegetation is dynamic, changing whether or not it is actively managed. Through vegetation management planning, managers can understand the vegetation dynamics within their park and coordinate short-term actions aimed at achieving long-term goals.

The complexity of any vegetation management program stems not only from the continually changing nature of the resource, but also from the diversity and interrelatedness of management goals to be achieved. Natural resource management, cultural resources management, visitor protection, planning, and maintenance all influence vegetation. Actions taken in one vegetative

setting often impact other settings. Coordination is best achieved through a comprehensive management plan which addresses relationships among all vegetation related activities in all areas of the park and its adjacent landscape.

Vegetation management plans are project statements or subsidiary action plans within the resource management plan. As such, they further detail the goals and objectives for vegetation established in the RMP. They describe the vegetation, set specific management policies and objectives, identify management techniques and research needs, and provide for long-term monitoring to identify and mitigate impacts on park ecosystems. They set the standards by which success can be measured. Overall, they provide for long-term program direction.

Planning for vegetation management requires problem identification, goal setting, information collection, alternatives analysis, action implementation, and evaluation of results. Plans will vary in complexity from park to park, but all plans should include, at a minimum, the following key elements:

1. an introduction, including the park's objectives for vegetation management and issues definition;

2. a synopsis or complete text of the vegetation assessment;

3. management alternatives for meeting the stated objectives and issues, including identification of specific management treatments, preferred alternatives, benefits and drawbacks, and annual goals;

4. a review of existing research findings and identification of research needs;

5. a plan for long-term monitoring, including quantitative standards against which success in achieving the park's objectives can be measured;

6. a strategy for achieving compliance with NEPA, the Endangered Species Act, and other compliance requirements;

7. an outline of interpretive and public involvement policies; and

8. assignment of roles and responsibilities.

The length and level of detail of vegetation management plans will depend on the complexity of resources in and adjacent to the park and on whether the plans are project statements or subsidiary action plans. For complex situations, the vegetation management plan could consist of an overview (elements 1-2, above) and a series of chapters discussing individual vegetation types, geographic areas, and/or projected activities (each with elements 2-8, above). As examples, chapters could address meadows, Yosemite Valley, or exotic plant control.

Site-specific activities are implemented through application of information specific to the project site. Such site-specific information describes the project in detail (who is going to do what, when, where, and how). It includes location and project maps, a description of methods, equipment, personnel, acreage or approximate dimensions, special constraints such as construction standards or protection of a threatened or endangered species or historic and prehistoric resources in the area, the time frame, permit requirements, notification needs, and monitoring procedures.

Monitoring is critical to evaluate the success of a program or project and to refine future activities. The monitoring procedures, statistical design, data analysis and presentation, and ability to modify management actions based on results should be established up front. The monitoring plan should specify who will do the monitoring; the areas to be monitored; the parameters to be monitored; the methods to be used to measure selected parameters; the sampling/monitoring schedule; the form in which work will be documented and results recorded, analyzed, and reported; and the individuals responsible for deciding that changes need to be made. (See Inventory and Monitoring, Chapter 5, in this Guideline.)

IV. Implementation

Once the management objectives have been established, and the planning accomplished, and compliance requirements have been addressed, the plan must be implemented. Parts of the plan may be implemented through people management. Existing laws and regulations may require better enforcement or new regulations may need to be put in place. Interpretive methods may need to be developed and implemented. Other parts of the plan involve projects that will require revegetation efforts.

On sites where the target community is a natural community, it is imperative, if at all possible, to preserve the topsoil with its seeds and other plant propagation tissues. If this is done properly, there may be no need for seeding. If, however, there is no topsoil available, or some cultural community is desired, then seed will probably be necessary.

Failure to pay close attention to the source of needed plant materials may cause problems if natural dynamics and genetic integrity are to be maintained. Seed of native plants from a source far from the project site could introduce genetic material different from that of the population in the area. If seed from a seed-increasing effort is produced on a site that is very different from the site where the seed was collected, local factors causing selection of genotypes that are suited to the new site may occur, and seeds produced at the new site may be of a different genetic makeup than the original seed collection. Collected materials as well as the selection of a site for propagation should approximate site conditions as closely as practicable. On small sites, it may be preferable to enhance seed production on site through temporary irrigation for a year or two to get the needed seed, rather than to produce the seed elsewhere.

In cultural zones, some parks may decide that perpetuating the genetic stock of particular "witness" trees is consistent with park objectives for the cultural landscape and enhances site interpretation (e.g., John Quincy Adams elm on the White House lawn). (See also Chapter 2, Exotic Species Management, Management of Special Categories of Exotics in Cultural Landscapes.)

When actual vegetation restoration work begins, it should be done in a manner sensitive to the values of the setting. In many cases, equipment operators need to be educated on the uniqueness of the NPS mission and the necessity of compliance with the conditions of the project plan or contract. Onsite education and inspection by someone responsible for compliance with the project conditions is usually necessary.

The NPS has a cooperative program with the USDA Soil Conservation Service (SCS) to provide technical information and native plant materials to parks. The SCS has 26 Plant Materials Centers located throughout the United States developing plants and technology. Requests for assistance should be directed through the regional offices to the Denver Service Center.

As a part of the monitoring program, it is essential to document what was actually done in a project to show how and to what degree the plan was followed. The great benefit of such documentation will come when another similar project becomes necessary. With good documentation, later workers can accurately evaluate the projects of their predecessors. The documentation should be specific, quantitative, and clear enough that it can be evaluated far into the future. Also, the documentation must be given long-term preservation in the park. NPS-28 specifies documentation required for work accomplished on a cultural landscape.

V. Information Needs and Sources

All vegetation management will be more effective if sufficient information is readily available and used. Some of the information is available in the form of publications of past work by researchers who have worked in the area or on similar sites. Some of it is stored in documentation of past projects. Some of it is available directly from the people who were involved in those projects. And some may be available from traditional Native American users of park vegetation.

Planning documents provide an understanding of how an area is intended to be managed. These include the statement for management, the development concept plan, the general management plan, the resource management plan, cultural landscape reports, and the land protection plan.

Plant and vegetation surveys document "what we have" and also show relationships to other issues. Products of these surveys include checklists, floras, NPFlora (a computerized species list of plants in many parks), inventories of rare or endangered plants or wildlife foods, vegetation maps and associated descriptions of plant community characteristics, and other such surveys. A reference collection of plant specimens is useful for identifying species in the study of the park's natural resources.

Resource base inventories are a compilation of specific components of an ecosystem that can be represented in data files, on maps, or in geographic information systems. Examples of components which can be included are precipitation, topography, geology and soils, vegetation, wildlife, aquatic areas, and facilities and developments. Also, critical communities, such as riparian, grassland, or subalpine, may be identified.

Vegetation history may be available from fire history studies, pollen studies, or Cultural Landscape Reports. Study of current plant communities and land use activities may also give information on past events and their frequency.

Resource Ethnographies or Traditional Use Studies examine the nature and frequency of use of area vegetation, purposes of the use (subsistence, manufacturing, religion), traditional practices regarding the use, and other factors related to the preservation of vegetation and other natural resources.

Sometimes it is necessary to obtain new information. If not already done, a basic vegetation inventory is the first step. Special studies of plant succession or of the vegetational results of plant restoration efforts may be needed. Such work requires use of proper methods and is best done by NPS research or resource management staff, landscape architects, or under contract.

Much vegetation management in parks can be considered experimental, because we cannot be sure of the results. The NPS operates with concepts and philosophies foreign to most land managers, especially when dealing with natural vegetation, because other agencies are usually managing to produce something from the land they administer. This places constraints, but also provides opportunity to add knowledge that could be helpful to those outside the NPS. Ideally, researchers should be involved in both planning and monitoring each vegetation management project. This will not only help future resource managers but could increase opportunities for the transfer of valuable scientific/resource management information outside the NPS.

VI. Communications

The sharing of information between park employees, visitors, and neighbors is important to the success of vegetation projects. The goal is to strengthen the understanding of vegetation concerns, provide instruction on how a particular area is affected, and receive information on what interested parties think and can do about the problem. Reports, news articles, audio-visual programs, and displays build awareness of the need for action. Field tours, seminars, and demonstration plots develop understanding of the program. Consultation with interested landowners, state and local governments, Native American tribes and groups, and other federal agencies help establish priorities and identify needed studies. All of these together lead to effective programs that resolve

vegetation problems and are well supported by the public. Such activities are especially important in influencing visitor behavior that directly affects vegetation.

ROLES AND RESPONSIBILITIES

I. Park

The **superintendent** is responsible for the park planning process through which vegetation management issues are identified, management plans are developed, priorities are established, and FTEs and funds are allocated. **Resource managers** analyze park resource problems, develop and recommend strategies, and manage the implementation of projects identified in the resource management plan to prevent disturbance, mitigate damage, restore vegetation, and conduct inventory and monitoring to determine resource baselines and document change.

Cultural resource specialists contribute to project proposal development and implementation of projects relating to cultural landscape objectives, and they review vegetation management proposals that could have an impact on cultural resources, formulate alternatives to prevent damage to cultural resources, and monitor the implementation of such projects. **Park rangers** and **maintenance specialists** participate in conducting vegetation mitigation and monitoring activities according to provisions of the management plans.

In the process of providing services to the public, maintenance personnel often are involved in operations that influence vegetation. Their activities may result in disturbance or contribute to recovery. Park and regional office natural and cultural resource and maintenance personnel should coordinate throughout all stages of planning a project in order to incorporate vegetation issues with other objectives, develop strategies such as prevention and salvage that may be critical to achieve desired results, and monitor progress.

II. Region

The **Regional Director** approves park resource management plans; allocates FTEs and funding among parks in the region; sets priorities for FTEs and funding; and monitors the results of park programs in terms of their success, compliance with policy and guidelines, adherence to technical requirements, and conformance to legal and fiscal conditions.

The **regional chief scientist** and **regional chief of resource management** provide advice on processes of project planning, and coordinate information exchange and research studies. They assist in priority setting; evaluation of vegetation programs; and in developing indices, data collection, and analysis. The regional chief scientist often manages NPS scientists or contractors who are conducting research on identified park vegetation problems. Actions relating to the cultural landscapes and ethnographic resources are reviewed by the **regional chief of cultural resources and his/her staff,** who provide advice in conducting historical research and site inventories, policy interpretation, planning, compliance, and coordination with the state historic preservation officer.

III. Washington Office

The **Associate Director, Natural Resources**, develops policy on resource issues and interprets policy for field units; develops Servicewide standards, methods, procedures, and guidelines for inventory and monitoring; provides decision assistance for scientific and resource management aspects of vegetation management; and provides technical assistance to regions and parks on ecosystems management and research issues of concern to the parks. Actions relating to cultural landscapes and ethnographic resources are reviewed by the **Associate Director, Cultural Resources,** who coordinates and develops policies, standards, and programs pertaining to the preservation, study, development, use, and management of cultural resources in the National Park System.

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NATIVE ANIMAL MANAGEMENT

This section presents guidelines for management of native animal populations, including all vertebrates and invertebrates. Although focused primarily on terrestrial animals, these guidelines are generally applicable to aquatic animals as well and complement the sections specifically addressed to aquatic resources. This section covers all programs and decisions that actively or passively influence native individual animals and populations. It is designed to assist parks in developing resource management plans and action plans for specific park programs in all park management zones: natural, cultural, park development, and special use zones as described in the NPS Management Policies and articulated in each park general management plan. It also covers all external concerns in managing native animal populations. In addition, it provides a process for finding solutions to native animal management situations.

The program guidance is divided into two main parts: **system management**, which deals with large-scale general programs that affect many animals and are interrelated with other park programs, and **population management**, which deals with specific animal management practices.

DEFINITIONS

Native animal species Those animal species that occur, have occurred, or may occur in a park as a result of natural processes. Species that have moved into park environments directly or indirectly as a result of human activities are not considered native except in cases where human activities accelerated native animal movements that would have occurred without human influence.

Demographic characteristics The particular rates of mortality, reproduction, and observed rate of increase for a given animal population. Demography and rate of increase are influenced by population size relative to an area's carrying capacity.

Species of concern All native animal species within a park that face an immediate danger of losing their natural role in an ecosystem because of human-induced change.

Population A group of individuals of one species that are found in a distinct portion of the species' range and that interbreed and have a common set of genetic characteristics.

Unnatural concentrations Populations of animals that are greater than those that would be sustained if it were not for human-induced changes in or out of a park. The concentration may be caused by an artificial barrier, by the removal of a significant predator, by the loss of a seasonal habitat, or by a human-induced behavioral avoidance of another area on the part of an animal.

Control Reduction of a population through management. Control may range from mild suppression to total elimination, depending on management capabilities and objectives.

Historic conditions Those ecological processes for which a natural or historic area is being managed. This does not necessarily mean a "vignette of primitive America." In some parks that condition is not yet or may never be fully understood, and in other parks the intent or language of the park's enabling legislation suggests more recent conditions should be the park's goal (e.g., the conditions present when the park was created). Historic conditions may be defined by the best historic information related to the park's objectives that is currently available. Historic conditions can be defined by historic photos, the first reports of European explorers, the first vegetation map of the area, fire scar information from trees, ethnohistorical information from traditionally associated Native American groups, and other evidence. The period by which historic conditions are defined will thus vary greatly from park to park.

Indicator species A species that is one of the first to show sensitivity to change or is representative of change.

POLICY AND PROGRAM OBJECTIVES

Each unit of the National Park System must conduct a native animal management program relative to the diversity, magnitude, and complexity of its animal resources. The NPS Management Policies that pertain to native animal management are as follows:

- The National Park Service will seek to perpetuate the native animal life as part of the natural ecosystem of parks. (4:5)

- Native animal populations will be protected against harvest, [except under certain specified conditions as enumerated in 4:6], removal, destruction, harassment, or harm through human action. (4:6)

- Natural processes will be relied on to control populations of native species to the greatest extent possible. Unnatural concentrations of native species caused by human activities may be controlled if the activities causing the concentrations cannot be controlled. (4:6)

- Animal populations or individuals will be controlled in natural, cultural, and development zones when they present a direct threat to visitor safety and health, and in cultural and development zones when necessary to protect property or landscaped areas. (4:6)

- The National Park Service will consult, as appropriate, with other federal land-managing agencies, the U.S. Fish and Wildlife Service, state agencies, native American authorities, and others regarding programs to control populations of fish and wildlife, research programs involving the taking of fish and resident wildlife, and cooperative studies and plans to guide public hunting outside park boundaries. (4:6)

- Parks having native migratory species (bats, caribou, geese, marine turtles, elk, frogs, salmon, whale, and butterflies, to name a few) will ensure the preservation of their populations and their habitats inside the park and will cooperate wherever possible with others to ensure the preservation of their populations and habitats outside the park. (4:7)

- The National Park Service will strive to protect the full range of genetic types (genotypes) native to plant and animal populations in the parks by perpetuating natural evolutionary processes and minimizing human interference with evolving genetic diversity. (4:10)

- When individual plants or animals must be removed for any reason - hunting, fishing, pest management, or culling to reduce excess populations resulting from human activities - the National Park Service will consider the need to maintain appropriate levels of genetic diversity in the residual park populations. (4:10)

- The National Park Service will strive to restore native species to parks wherever all the following criteria can be met: Adequate habitat to support the species [at a viable population level] either exists or can reasonably be restored....The species does not...pose a serious threat to [humans]....The [restored population] most nearly approximates the extirpated subspecies or race....The species disappeared...as a direct or indirect result of human-induced change....(4:10)

- The [restoration] of native...animals will be accomplished using organisms taken from populations as closely related genetically and ecologically as possible to the park populations. (4:10)

- Native pests [animal or plant populations that interfere with the purposes of the park] will be allowed to function unimpeded except where control is desirable to prevent the loss of the host or host-dependent species from the ecosystem; to prevent outbreaks of the pest from spreading... outside the park; to conserve threatened, endangered, or unique plant specimens or communities; to preserve, maintain, or restore the historical integrity of cultural resources; to conserve and protect plants and animals in developed zones; to manage a human health hazard as defined by the Centers for Disease Control or to protect against a significant threat to public safety. (4:13)

- Superintendents will develop agreements with other federal, state, and local agencies, native American authorities, and private landowners where appropriate to coordinate plant and animal management activities....In addition, superintendents will seek the cooperation of others in minimizing the impacts of outside influences...and other means of preserving and protecting park resources. (4:5)

- Hunting and trapping wildlife will be allowed only in parks where such use is specifically authorized. (4:7)

- In areas set aside with legal authorization for hunting, trapping, fishing, subsistence use, or other harvest of native wildlife, the National Park Service will still seek to perpetuate native animal life and to protect the integrity of natural ecosystems. (4:7)

Where warranted by existing animal management issues, the animal management program should include development of a section of the resource management plan which clearly states overall goals and objectives; describes animal management issues; identifies needed actions to address issues; and establishes priorities and multi-year programming requirements.

Management strives to perpetuate natural ecosystems through maintaining or restoring natural processes to the extent practically feasible. In most parks, maintaining, restoring, or simulating natural processes is a more realistic goal than is the pursuit of a hypothetical static situation that is unachievable and may even be undesirable. Examples of natural processes are natural selection, wildland fire, predation, and succession.

Managers must give primary consideration to the welfare of native animals, but must also provide for public enjoyment. While management techniques vary depending upon species of animals, habitat conditions, and levels of visitation, native animal management carried out through regulation of human activities requires data bases as substantial as those supporting hands-on management. Regulation of human activities is often controversial.

Research can provide information that can be used to fine-tune regulations and often provides the basis for easing of restrictions, allowing greater opportunities for satisfying visitor experiences and enjoyment.

Animal management often must reconcile differences between the NPS objectives and those of other agencies and groups with very different missions. In carrying out its animal management program, the NPS must work cooperatively with various publics and other federal, state, and local agencies, Native American authorities, international interests, and private landowners.

AUTHORITIES

In addition to the general authorities discussed in Chapter 1, direction for animal management programs comes from executive orders and other statutory authorities.

Significant authority is granted to the NPS for the management of native animal populations. Congress, in exercise of its power under the Constitution, directed that the Secretary of the Interior manage animal life in National Park System units. Since this grant of authority in the Organic Act and in specific park enabling legislation, many court cases have upheld this authority.

The authority to regulate native animals within a national park unit is not dependent upon type of jurisdiction and is not limited to federally owned land. The property clause of the U.S. Constitution empowers Congress to make needed rules and regulations with respect to federal property. This provision is primarily a grant of power to regulate activity occurring on federal lands. However, Congress, and, through the Congressional grant of regulatory authority, the NPS, may extend its regulatory authority beyond federal lands onto nonfederal property within the parks. While the goal of park management will be to reach cooperative agreement with nonfederal land holders, where this agreement cannot be reached the NPS can take appropriate protective actions addressing activities which adversely affect native animal populations. Such activities include hunting, fishing, and trapping within the boundaries of a park and on private or state lands, or impacts of nonfederal activities on migratory populations outside park boundaries.

Some of the federal statutes that pertain to management of native animals include the Bald and Golden Eagles Protection Act; Endangered Species Act; Federal Environmental Pesticide Act; Federal Insecticide, Fungicide, and Rodenticide Act; Lacey Act; Migratory Bird Treaty Act; National Environmental Policy Act; and others. In addition, regulations found in 36 CFR specifically address preservation of native wildlife. There are also several international treaties that directly or indirectly affect the management of animal life in parks.

In addition to its broad legal authority, the NPS may enter into agreements with state, local, and federal agencies to manage animal populations outside of the parks. In carrying out its responsibilities to manage native animals within National Park System areas, the NPS seeks to obtain state concurrence in the protection and management of wildlife and fish. The necessity for concurrence is outlined in 43 CFR 24, Department of the Interior Fish and Wildlife Policy: State and Federal Relationships.

RELATIONSHIP TO OTHER GUIDANCE

National legislation, external influences, and specific park legislation present special concerns and provide direction for management of native animal populations. Programs that address many of these concerns are covered in other sections of this Guideline, including Chapter 2, Vegetation Management, Freshwater Resources Management, Marine Resources Management, Fire Management, Integrated Pest Management, Endangered, Threatened, and Rare Species Management, Exotic Species Management, Hazardous Waste Management, and Public Health and Safety; Chapter 3, Grazing, Hunting and Trapping, Fishing, Backcountry Recreation Management, and Subsistence and Other Traditional Uses.

Other NPS guidelines which relate to the management of native animals include NPS-2, the Planning Process guideline; NPS-9, the Law Enforcement guideline; NPS-12, the Environmental Compliance guideline; NPS-18, the Fire Management guideline; NPS-28, the Cultural Resources Management guideline; NPS-44, the Personal Property Management guideline, Chapter 10, Management of Firearms and Ammunition; NPS-48, the Concession Management guideline; and NPS-53, the Special Park Uses guideline.

PROGRAM GUIDANCE

I. System Management

A. Biological Diversity

National parks are becoming increasingly isolated from other natural landscapes. Until recently the national parks were considered safe havens for native plants and animals. We now know even the most remote and well protected areas are threatened by encroachment by human influences. Most parks may be too small to protect biological diversity on their own, but through the steps listed below parks can influence biodiversity and, when possible, contribute to the understanding of its importance.

Steps to establish a program and information needs for biological diversity include the following.

1. Conduct surveys, inventories, and monitoring to assess biological diversity.

2. Develop a network for sharing of information related to biological diversity.

3. Identify and protect corridors for animal movement or migration.

4. Identify land and animal management practices adjacent to parks that have negative impacts on the biological diversity and design a system to address these threats. This includes international contacts.

5. Support research that looks at regional as well as park-specific concerns.

6. Establish criteria for indicator species in parks. Determine the species' demographic, social, and genetic parameters; experimentally test extinction models; and develop the criteria for extrapolation of this information to the other species of concern in a park.

7. Identify the areas around parks critical for the protection of biological diversity of native animal species.

The goal of maintaining natural biological diversity does not supersede other NPS policies and guidelines or the purposes for which the park was established. Biological diversity programs may not be used to support introduction or retention of an exotic species because it enhances biological diversity. Exotic species are to be managed according to the NPS policy and the Exotic Species Management section of this Guideline.

B. Genetic Diversity

Small populations are subject to risk of extinction and extirpation due to population instability, isolation, erosion of genetic variability, and inbreeding. Populations with reduced genetic variation often demonstrate lowered fecundity and survival of young. This has been documented in inbred zoo and fish hatchery populations and is suspected in some wild populations. It may have a long-term effect on the continued survival of a population. The question of limited genetic variation remains largely untested for most wild populations but must be addressed as a potential threat where native animal populations are currently known to exist at lower levels than in the past, where remnant populations exist, or where the reproductive capacity of a population is deemed low enough to inhibit its genetic diversity.

Genetic variation may be tested in a park population when any of the following justifications for the work have been made:

1. a federally or state-listed threatened or endangered species is involved, and the best biological opinions or specific genetic research suggests that limited genetic variability is contributing to the species' decline and where appropriate permits can be obtained to take or study individuals (see Chapter 2, Endangered, Threatened, and Rare Species Management);

2. the population is clearly a remnant or relict group originating from a small gene pool, as in the fenced bison herds in small prairie parks;

3. when research suggests the limited genetic variation is directly or indirectly related to human influences;

4. when the information obtained outweighs the negative impact or jeopardy to the population from the handling required for the genetic research (where the population may be jeopardized by the handling required for the testing, the manager may be aided by models predicting minimum population viability, notwithstanding the potential limitations of modeling when not all variables are known; for example, the amount of gene flow to the population is rarely totally documented or known); and

5. where native populations are at risk through augmentation with non-native populations.

More extensive genetic monitoring of populations is encouraged where it is not disturbing and where the research is part of an approved resource management plan, monitoring program, or research study. Genetic diversity should be compared within and between populations, wherever possible, to increase the basic understanding of the genetic variation present in the NPS areas and to identify any potential problems.

Information also needs to be gathered on the distribution, numbers, and movement of populations in and out of the park in order to better understand whether a park population is becoming isolated.

Where limited genetic variation is detected and the cause is human-related, population augmentation may be justified to increase the viability and the security of a population. No action should be taken where there is no evidence of inbreeding or limited genetic variation or where the cause is determined to be natural. Maintenance of overall ecosystem stability and evolutionary processes should take precedence over individual species.

C. NPS Management Zones

The NPS management policies make a distinction among various management zones (natural, cultural, development, and special use). The application of animal management principles depends greatly on the management zone within which the animal population resides. A description of animal management within these zones can be found in the NPS Management Policies (4:9).

The animal management challenge presented by the existence of these land classifications is a microcosm of the problem of parks as partial ecosystems. The management of development, special use, and cultural zones within or adjacent to a natural zone must be done in such a way that no significant measurable influence occurs on native animal populations outside of that cultural, special use, or development zone. Park management activities such as vegetation management, localized pollution, and facility construction can lead to habituation, unnatural population densities, and animal mortality outside of the management zone. This should be carefully monitored and, when detected, mitigation measures should be carried out only within the development, cultural, or special use zone.

Native animal management within the different management zones should be based on sound management objectives and complete scientific analysis of these lands prior to their classification. This will ensure that development, special use, and cultural preservation activities are compatible with perpetuation of natural ecosystems in adjacent natural zones.

The objective for management of native animals within cultural, development, and special use zones is to ensure that the native animal populations do not have a negative influence on the purpose for which the development, special use, or cultural zone was established, while also trying to replicate as closely as possible the conditions which would exist if the area were in a natural zone.

Control measures may be initiated on a native animal population within cultural, special use, or development zones provided that:

1. the management of native animals does not detract from the objectives of the zone as articulated in enabling legislation, DCP, master plan, or GMP;

2. techniques for animal control are not unnecessarily disruptive, unsafe, or obtrusive;

3. the control takes place in the development, special use, or cultural zone only;

4. the control does not adversely influence natural processes in the natural zone; and\or

5. the animal population being managed is defined as a pest population and IPM procedures are followed in conducting a management program.

D. External and Internal Concerns

The NPS units and their native animal populations may be affected by activities on non-NPS lands located both within and adjacent to park boundaries.

Superintendents should seek to mitigate such activities by encouraging voluntary cooperation on the part of private landowners and by representing the park's needs and concerns before local zoning and planning groups. The superintendent should also look for opportunities to enter into cooperative and interagency agreements and memoranda of understanding with other federal and state agencies on research, monitoring, and management of the species of concern, and, where appropriate, promulgate regulations.

E. Assessing Effects of Historic Animal Management Practices

Past management of native animals within NPS-administered areas has resulted in a variety of human-induced changes in animal populations. Such activities as predator control, fish stocking, fire suppression, and management for "charismatic" species have led to current situations where native animals do not exist at natural levels or demography, or in natural ecologic relationships. Parks should evaluate the status of native animal populations through the inventory and monitoring process.

Factors that should be analyzed to evaluate the effects of historic management on native animal populations include:

1. consumptive uses such as hunting, trapping, fishing, and collecting;

2. animal controls established for human safety;

3. public use patterns and methods (e.g., snowmobile, hiking, camping, aircraft use) that have developed over time;

4. activities of park residents and concessioners;

5. existing agreements with nonpark entities which internally and externally affect native fish and wildlife;

6. pest control activities;

7. construction of park facilities; and

8. habitat modification prior to park establishment, such as logging.

Resource management plans should specifically address the steps that will be undertaken to restore native animal populations which have been affected by historic management.

F. Interagency Management

Park managers should develop working relationships with other agencies whenever possible. These working relationships should anticipate and seek to avoid conflicts, encourage cooperative activities that advance park management, and share factual information.

Superintendents should, when possible, develop a forum for information sharing with other agencies and organizations whose activities affect animal populations. This forum can, through timely notice of program planning, encourage coordination of activities at the ground level, ensure that each agency or organization considers how its activities will affect animal populations outside of its boundaries, and allow advance consideration of how exterior management will affect in-park resources. Written formal agreements should be established wherever possible to ensure communication and cooperation with other agencies and organizations.

Interagency planning efforts should identify any gaps in scientific data, especially data that are needed for future planning or data that are needed to evaluate the effectiveness of current management programs. In planning, funding, and carrying out resource programs, interagency cooperation should be stressed.

G. Human Use Management

Most management of native animals carried out by the NPS is not hands-on management of species but rather management of visitor activities or habitat conditions. Hands-on management includes such actions as capture and removal of surplus elk and bison from small, fenced, prairie parks; translocating or killing problem bears; and restoration of extirpated indigenous species.

Examples of management of native animals by regulating human activities include restricting numbers and activities of vessels in whale waters (Glacier Bay); installing bear-proof garbage cans and campground food caches (Yellowstone); providing bear-resistant food containers to backpackers (Denali); regulating or prohibiting low-level aircraft flights near sensitive wildlife areas; and requiring anglers to immediately place a fish caught for food in a plastic bag and carry it to a

structure equipped with a garbage disposal for cleaning and storage before continuing to fish, to prevent attracting bears (Katmai).

Title 36 of the CFR provides for the implementation of regulations which protect and conserve native animal life. These include:

- Section 1.5, which allows superintendents to manage visitors through public use limits, establishing closures, control of visitation hours, restriction of type of activity;
- Section 1.6, which authorizes superintendents to issue permits, which allow for the regulation of use and the education of visitors about animal management concerns;
- Section 1.10, which allows for the placement of signs for designation of use restrictions and closures;
- Section 2.1, which provides for the protection of natural and other resources, including provision for the protection of animals from disturbing, injuring, or removing live or dead animal resources;
- Section 2.2, which is directed specifically to the protection of wildlife;
- Section 2.3, which authorizes recreational fishing and provides general fishing regulations applicable to all parks;
- Section 2.4, which allows for the control and restriction of weapons, traps, and nets;
- Section 2.5, which provides guidance and regulation concerning research specimens; and
- Sections 7.1-7.100, which provide special recreational fishing regulations, park by park, if any.

The recreational fishing sections and additional sections of the CFR allow for the management of human uses to mitigate or eliminate their effects on native animal life. Through the discretionary authority granted in some of these sections and through the establishment of special regulations, the superintendent has the authority to initiate specific actions that allow for the implementation of control measures.

The use of area closures is a common measure to protect native animal life. Closures to human entry may be employed where human activity is resulting in loss of habitat, animal avoidance of an

area, or reduced productivity in park wildlife. The use of closures is supported where a species, partially or completely extirpated from a park, may naturally re-establish itself from an adjacent population and where human use may jeopardize such re-establishment. Closures must be well supported by research and be as small as possible to eliminate the problem. They should be restricted only to the season of impact unless out of season activities will degrade the habitat.

Closures should not extend to large areas of parks. Overly large closures to "confuse" visitors over the exact location of a wildlife key site should not be practiced except in certain situations, such as when working with colonially breeding waterbirds. Unnecessarily large closures that also serve to protect potential key sites are not appropriate, since closures may be rapidly modified to accommodate new sites under use.

Closures to facilitate enforcement are rarely justifiable. Eliminating all potential disturbances to an animal are not justified. Only those disturbances that result in demonstrable negative effects on the animal should be guarded against.

When implementing human use control, it may be wiser to avoid signs, advertising, or closure of an area if the secrecy results in greater protection of the site or species. For example, some raptor eyrie locations are better kept confidential. Restrictions may also be applied against certain user groups (e.g., photographers) or certain vehicles (ORVs, snowmachines) if the negative impact has been identified from that specific source. The use of a permitting system may be a useful way to gather information on visitor use patterns, to educate visitors, and to restrict use. However, it may also be expensive and logistically difficult to manage.

H. Consumptive Uses

Consumptive uses of native animal populations are not permitted except where specifically authorized by law. (See Chapter 3, Hunting and Trapping, and Fishing for guidance on this subject.)

I. Alaska National Park System Units

Subsistence hunting, fishing, and trapping were authorized in certain Alaskan national parks and monuments which were designated in December 1980. (See Chapter 3, Subsistence and Other Traditional Uses, for guidance on this subject.)

II. Population Management

A. Habitat Manipulation

Habitat manipulation for management of native animals may be permitted when the manipulation is necessary to maintain or increase current numbers of a federally listed threatened or endangered animal species in accordance with approved recovery plans, or when the action, as documented in

an approved resource management plan, may help to prevent a species of concern from declining below a stable population.

In historic zones, habitat manipulation may be used to recreate a scene that is mandated by the enabling legislation of the area, the GMP, or is deemed essential to the original intent for which the park was designated. For historic zones in parks where a historical perspective is not essential to the management goals or original purposes for the area, or to the intent of the enabling legislation, the area should be managed as a natural area to the largest extent possible and consistent with Sections 106 and 110 of the National Historic Preservation Act.

Habitat manipulation may also be used when recreating or simulating a natural feature, natural process, or parameters of critical habitat, and in cases where factors or conditions are no longer present to accomplish this without management intervention. For example, prescribed burning may be employed to duplicate historic fire regimes in circumstances where fire is essential to the maintenance of natural ecosystem processes and/or the welfare of a species of concern but where natural fire can no longer be permitted to function. Habitats can be manipulated to restore a disturbed or altered habitat.

In general, habitat manipulation should **not** be practiced for healthy species in natural zones; in order to sustain increased levels of human harvest or unnatural levels of animals to increase consumptive uses, even where harvests are authorized; or to benefit an exotic game animal, except where specifically described in enabling legislation.

Where management of harvested populations under these guidelines conflicts with or severely impacts Native American traditional culture or sacred ceremonial use of the resource, an effective consulting relationship must be established and maintained with the affected Native American tribe or group. Their concerns must be considered according to the Native American relationship management policy provisions of the NPS Management Policies. Traditional, cultural, or ceremonial use, however, should not adversely affect park resources. (See further, Chapter 3, Subsistence and Other Traditional Uses.)

B. Control of Unnatural Concentrations or Abundances of Animals

Control of native animals may be justified under the following conditions if the activities causing the concentrations cannot be altered or controlled:

1. Where there is an unnatural concentration of a species due to human influences such as loss of a significant habitat, loss of a migration route, an obstruction, or avoidance of a part of its range due to human activities.

2. When an unnatural concentration of the species occurs because of loss of one or more significant natural predators due to human-induced change.

3. When the species' abundance has been increased by human-caused influences; for example, an increased forage base for deer or other species from agricultural crops inside or outside the park, or garbage food sources for yellow jackets or other native wildlife that will consume garbage. Other, more subtle human-caused influences that may increase species abundance include irrigation, flooding control, control of water levels, cloud seeding, and others.

4. When there is increased transmission of disease or parasites in animals due to the unnatural concentrations or abundances.

5. When demographic patterns have been altered due to unnatural concentrations or abundances and habitat deterioration caused directly or indirectly by human intervention.

The negative effects of the overabundant population should be measurable and known to be human induced before a treatment is justified. Documented unnatural physical damage from the overabundance, including trampling of vegetation, soil compaction, rubbing or barking of trees, or wallowing that exceeds known natural levels of such disturbance, would justify control.

Prior to control of an overabundant native animal population the following information should be gathered:

1. The numerical abundance and trend (rate of population growth) should be determined for both the presumed overabundant species and any plant or animal species hypothesized to be negatively impacted.

2. A negative impact on another plant or animal or upon the physical environment must be documented by research or monitoring. Cursory, visual, or subjective assessments of the impacts are considered preliminary. The impacts must result from human induced change. Some approved methods of documentation include exclosure comparisons with nearby use areas that document the conditions that depart from natural conditions; comparisons with more natural situations; comparisons with historic photographs; trends on permanently marked vegetation plots; and use of pollen or sediment cores showing alterations from natural trends, provided the effects can be isolated from climatic trends.

3. Any likely adverse effects of the control program should be quantified. For example, behavior avoidance from control actions might concentrate animals in other locales, causing a new site of impacts or disturbance of other native wildlife. The benefits of the control should outweigh any such negative side effects. Poorly justified or unsuccessful programs should be discontinued.

4. Historic, ethnographic, or natural conditions should be adequately understood before any control program is initiated. Research into understanding historic and ethnographic conditions is an ongoing process. Lack of knowledge about historic, ethnographic, or natural conditions is a major deficiency in most parks. New or experimental techniques for understanding those conditions are appropriate avenues to explore.

The level of precision and the time and energy expended to obtain the needed information should occur in direct proportion to the level or degree of population reduction desired, the influence of the action upon the ecosystem, and the political sensitivity of the action. Normally, for more easily censused species, a minimum confidence interval on the population estimation is $\pm$ 20%, with $\pm$ 10% more desirable. For some secretive or nocturnal species (e.g., bears, raccoons, and some rodents), even those confidence levels are not obtainable. In those cases, a measurable reduction in the unnatural impacts should become the primary criterion for evaluating the program's success. However, no control program should be allowed to jeopardize the controlled species through lack of information on the species.

Management actions to alleviate the problem of overabundance follow in order of preference:

1. Remove or mitigate the cause of the overabundance including any physical barriers to movements or human induced habitat expansion or forage base that are causing the concentration. Consult, cooperate, and coordinate with other agencies or the public to protect or restore the lost seasonal ranges or movement routes. A limited restriction or easement on grazing or hunting, or limiting other recreational activities may allow the species to regain the lost habitat.

2. Public hunting or trapping outside of the park is the second preferred management option. Public hunting within the park will not occur for control purposes, except where specifically authorized by law. Where authorized, hunting or trapping may be used for control purposes.

3. Restore populations of native predators.

4. Implement live-trapping and translocation to another locality. However, consideration should be given to adverse alteration of gene pools if translocation involves large numbers of animals or will occur over long distances.

5. Fertility control should be practiced where feasible, and if the fertility control does not lead to an imbalance in the naturalness of a population.

6. Direct reduction (killing) by qualified NPS personnel may be practiced as the last option. (See the NPS Management Policies 4:6 on the disposal of carcasses and live animals.)

Control programs must be predicated on scientifically valid planning. Control plans must be approved by the Regional Director, and must comply with the National Environmental Policy Act. Cost, difficulty, and political sensitivity of a control program should be considered when deciding whether to conduct such a program.

The control program should be periodically evaluated and the results of the evaluation reported upon.

Cooperative agreements with land management agencies or landowners adjacent to the park may be necessary to resolve conflicts involving overabundant animals that move out of the park. Superintendents might encourage relatively light harvests of populations of native animals moving onto adjacent lands in order to maintain ecosystem processes in parks. Conversely, superintendents might seek intense harvests of such migratory populations if habitat manipulation outside parks has resulted in increased animal densities inside.

C. Restoration of Native Species

Restoration (re-establishment) of a native species may occur after the following determinations or preparations are made:

1. Adequate proof exists that the species occurred in the area and that its absence is human caused. A habitat analysis should be conducted to verify that enough land and water area exists to support a viable population of the species. All other essential elements, including water, forage, nest or den sites, cover, and others should exist.

2. A restoration action plan has been developed.

3. There is an adequate source of animals.

4. There are no significant problems with predators at the release site, or the problems can be resolved.

5. A review concludes that the extirpation was human caused.

6. A review indicates that the prospects for natural re-establishment are minimal, but that restoration has a good chance for success.

A restoration action plan should be prepared to include:

1. An analysis of the selection of source animals to include the most closely related individuals with regard to size, external morphology, genetic background, and behavior to the extirpated species, except where other considerations exist.

2. Preparations for the safest and most humane transport of the source stock.

3. An analysis of the best release sites that minimize conflicts with native predators and humans afford the released animals the best chance of survival and procreation.

4. Possible temporary holding of the source stock in a structure or enclosure until they have acclimated or where a gentle release is desired. Any disadvantages to the use of the facility, such as increased transmission of disease or increased vulnerability to predators, should be recognized and weighed against the benefits of utilizing the enclosure. The enclosure or structure should be removed after release, except where it benefits the recovering species, in which case it should be removed after the recovery is complete.

D. Augmentation of Diminished Populations

Augmentation of existing but diminished populations may occur when one or more of the following conditions are met:

1. Changes in demographic characteristics, reduced genetic variability, or the associated influence of reduced fecundity are verified.

2. The diminished population is seriously threatened with extirpation.

3. The augmentation is essential to the species' recovery, and the diminished status was the result of human influence.

4. The continued diminished status negatively impacts a second species of special concern or a rare, threatened, or endangered species.

Augmentation of a diminished population may **not** take place to enhance a harvested population (in these cases, the harvest level should be reduced); where natural recovery without the augmentation is likely; or where the source stock is not of similar genetic background.

Parks may also provide source animals to other areas when populations in other parks will benefit by the augmentation and when augmentation will enhance the entire regional, state, or area population.
Parks may not provide source animals for restorations or population enhancement when the purpose is for enhancing a population that is currently harvested in the area where the augmentation will occur (unless the enhancement is part of an approved recovery plan); when the population in the donor park will be adversely impacted by the removal of the animals; or when the removal results in an alteration in the donor park's population demographic characteristics or reduces the availability of prey to predators and scavengers.

Where a park has an overabundant animal population, however, the animals may be donated to any stocking or restoration program, as part of an approved plan, including situations where the relocated animals are used expressly for stocking for sport hunting.

E. Predator Management

Predators are part of the natural ecosystem. No native predator may be destroyed on account of its normal utilization of any native animal unless it is part of an approved threatened and endangered species recovery program.

Control of predators that are killing livestock or fish and other game animals may be practiced outside of the park's boundaries or in certain cases where predation is on legally grazed livestock within an NPS area, and where this control does not impact predator populations and an approved resource plan allows for the control. Entry into the park for the purpose of controlling predators is not permitted.

The NPS may cooperate in the control of predators that are causing financial damage, for example, by controlling any human influenced attractant in the park which is exacerbating the problem (for example garbage), or by properly managing or restoring the prey base of the predator, or by reporting a predator's departure from the park.

F. Nuisance Animals

Nuisance animals (and pest animals) may be controlled in limited or localized situations where a problem exists because of conflicts with visitor safety, property, natural features, cultural resources, or park facilities or operations. Impacts from nuisance animals fall short of the pest category designation. Animals falling under a "pest" designation are covered under the IPM guidelines (see Chapter 2). The IPM guidelines should be referred to prior to any control of a nuisance or pest.

To avoid problems, inventories of potential nuisance animal situations should be made prior to the planning of any park facility, structure, or activity. Examples would include surveys of beaver dams or potential beaver habitat, snake dens, yellow jacket concentrations, marmot colonies, and so on. Structures and developments should avoid rattlesnake dens, marmot colonies, mineral licks, and any other concentration area. Facilities should be built to minimize problems after reviewing the known information. As an example, most beaver problems can be reduced by using clear span bridges rather than culverts, avoiding center pier bridges, and routing trails and roads away from known habitat.

Studies should be conducted to determine whether relocation of nuisance animals would cause additional problems such as disruption of the social system of saturated populations into which they are relocated. In these cases, destruction becomes the preferred alternative.

Removal of nuisance animals may be undertaken to reduce a threat to public health or safety (e.g., rattlesnakes or yellow jackets). In some instances, such removal requires a FWS permit. (For further information, see NPS-53, the Special Park Uses guideline.) The removal should be restricted to developed, historic, and special use areas only. Removal is also justified to protect public health (e.g., water supplies) and to protect private property or park facilities. In this situation, again, only limited removal is normally justifiable. Alternatives to control, such as warning signs, vegetation modifications, or removal of facilities, are always preferable to control.

Actions which can be taken, in order of priority, are relocation of facilities or mitigation of the problems, trapping and relocation, aversive conditioning, and destruction, including poisoning under an approved IPM plan or request.

G. Control of Diseases

Parks may control diseases in native animal populations under any of the following conditions:

1. The disease is an exotic organism.
2. The disease is likely to be transmitted to livestock.
3. The disease is a threat to human health.
4. The disease is a natural one, but conditions which would contribute to natural limitation of the spread of the disease are no longer present.
5. The disease threatens to extirpate a relict population from the park.
6. The disease threatens a threatened or endangered species.
7. Upon completion of a plan approved by the Regional Director.

Parks should **not** control diseases when the pathogen is native and its effects on animal populations are natural; when the disease presents no threat to livestock, humans, or local agricultural concerns (control of a natural organism within the park in order to enhance sport hunting of game adjacent to the park would not justify disease control); when control of the disease is impractical; or when control would seriously threaten the park's animal population.

If there is a need to control a disease, a monitoring program should be initiated to evaluate the effects of the treatment.

H. Trapping, Tagging, and Collecting

Live-trapping, physical restraint, darting and immobilizing, and collaring, marking, or tagging of animals may be conducted as part of an approved management program or research study when the following general circumstances are reviewed:

1. When such tagging is the only scientifically valid method to obtain needed research data.

2. The benefits of the information must outweigh the negative features of the handling, such as potential mortalities and disturbance. The less numerous and less secure the population, the greater should be the need for the handling to justify it.

3. The least disruptive handling technique or immobilizing drug should be selected.

4. Safety to the human handlers must be a consideration, and in some situations this may cause a different technique or drug to be selected.

5. Research that aids other parks, or tests basic NPS policy applications, or is critical for park management will justify greater disruptions.

In consideration of the viewing public, the marking, tagging, or collaring technique used should allow the device to fade or fall off within a relatively short time after completion of the study. Radio-telemetry must be conducted in accordance with state and federal permit requirements for use of radio transmitters, as well as with park permit requirements.

Collecting animals is allowed only if it results in information that provides for increased protection of resources or scientific knowledge not otherwise available, and if the collecting cannot be done outside the park. A collecting permit is required, and the NPS procedures for accessioning and cataloging specimens must be followed.

Where there is no pressing management need, extensive handling may not be justified. Non-manipulative monitoring is preferred in these cases. Often the proposed research can be conducted in an adjacent area less restrictive to the handling of animals than are parks. The park or regional research scientist and park resource manager should be consulted on the most appropriate technique for the park. Regulations on handling and transporting wildlife are found at 9 CFR 1 and 9 CFR 3, subchapter 3. (See further, Chapter 5, Research Administration, Collections, and Certification.)

I. Injured, Dead, and Stranded Animals

The workings of natural processes within a park result in the injury, death, and unnatural isolation or stranding of native animal species. In addition, the natural processes within a park combined

In those areas where movements or migrations of animals cross park boundaries, the following management programs are recommended.

Interagency or international working groups should be established where each agency involved will consult, coordinate, and cooperate to the maximum extent possible to reach its goals. For species of concern, the NPS must strive to protect the natural conditions and processes and the ecosystem integrity to the greatest extent possible. This includes the regulation of activities on nonfederal land within the legislated boundaries of the park where a value inherent to the establishment of the area is at risk.

Research, including research outside of the park boundaries, should be conducted indirectly or directly by the NPS resource managers and scientists to gather information on which to base actions to preserve the species.

Where the NPS is granted certain rights of riparian ownership under state law on nonfederal lands beyond the boundaries of the park, the NPS must exercise these rights in such a manner as to protect migratory populations, preserve visitor enjoyment of migratory populations, and minimize conflicts between incompatible uses.

L. Scientific Specimen Collection

Collecting biological specimens for scientific purposes must be authorized by the park superintendent in accordance with requirements in 36 CFR 2.50. The mechanism for scientific sample collections is the Specimen Collection permit, covered in 36 CFR 2.5 and NPS-53, the Special Park Uses guideline. See also, Chapter 5, Collections, in this Guideline.

ROLES AND RESPONSIBILITIES

I. Park

The **superintendent** is specifically responsible for the following:

1. ensuring completion of specific resource management plans and project statements within the parameters of funding and direction provided by the Regional Director;

2. supervision of all native animal management programs to ensure direction is maintained and that these concerns are integrated into all park operations;

3. establishment of an inventory and monitoring program and management of data and collections;

4. ensuring administrative and peer review of resource management and science programs;

5. predicting and resolving animal management conflicts or concerns based upon scientific and political concerns;

6. maintenance of records in a fashion to prevent loss and promote use of data;

7. interagency, interdisciplinary, and interdivisional information exchange;

8. periodic review and reporting of animal management programs;

9. clearly articulating the need for funding and staffing for animal management to the regional office;

10. ensuring that personnel are properly trained to carry out the tasks assigned;

11. obtaining necessary permits from federal and state agencies; and

12. articulating the need for any research studies prior to embarking on management programs that could potentially affect the native animals in a park.

The role of the **resource manager** within the park is to:

1. help scientists to develop and implement an inventory and monitoring program for native animals;

2. apply the findings of research;

3. conduct necessary planning programs to ensure that the resource management plan and other park operations are done in accordance with this Guideline; and

4. make recommendations to the superintendent as to information needs and the most up to date and accurate methods to fulfill those needs.

The role of the **park or contract research scientist** is to:

1. design and develop an inventory and monitoring program for native animals;

2. conduct original studies in accordance with park policy and approved resource management plans;

3. modify research techniques or develop research techniques that reduce the impacts of research on native animal populations;

4. publish research findings;

5. provide the reputable data base upon which management actions and resource monitoring programs can be based;

6. provide the superintendent with a comprehensive and comprehensible document on findings of the research;

7. keep abreast of current findings and new techniques and methods to ensure that all research is state of the art; and

8. aid the superintendent in interpreting research policies and guidelines.

II. Region

The role of the **regional chief scientist** is to:

1. advise the Regional Director and superintendents on matters of native animal management and information needs, and respond to park and regional scientific needs;

2. provide an opportunity and atmosphere for communication of information needs from superintendents;

3. contract or supervise research that is identified in the park resource management plan and requested by the superintendent; and

4. establish research programs and budgets to meet the region's needs.

III. Washington Office

The Washington Office **Wildlife and Vegetation Division** is responsible for the planning, coordination, policy formulation, and implementation of animal management programs at the Servicewide level. This includes planning, funding, and coordinating research studies on issues of Servicewide applicability; providing technical, scientific, planning, or implementation assistance to regions and/or parks on certain animal management issues or projects; and developing and implementating procedures, standards, and protocols for baseline inventory and long-term monitoring.

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FRESHWATER RESOURCES MANAGEMENT

Fresh water is a particularly important and sensitive ecosystem component. Its physical availability and quality are critical determinants not only of aquatic resources, but of a park's overall natural resource conditions. Surface water and groundwater are important in determining site suitability and uses, while also serving as important transport mechanisms. Depending upon watershed characteristics and the hydrologic cycle, water often connects park resources to resources outside park boundaries. Water may thus deliver pollutants generated by activities outside park boundaries to park waters, or transport pollutants generated within the park to waters outside its boundaries. Similarly, impacts on aquatic ecosystems due to alterations of natural populations or environments may cross park boundaries via the aquatic environment.

This section provides resource management guidance in three categories related to freshwater resources:

I. Water Resources Management discusses water quality management, water quantity management, and water resources planning.

II. Aquatic Biological Resources Management discusses management considerations that relate to aquatic organisms.

III. Aquatic Habitat Protection and Management provides principles and guidance relating to habitat protection, including wetland and floodplain management.

DEFINITIONS

Adjudicate To pass on judicially; to decide, settle, or decree; adjudge. An adjudication is the equivalent of a "determination" and contemplates that the claims of all parties have been considered and set to rest.

Appropriative water right An exclusive property right, acquired under procedures provided by state law, to apply water to beneficial uses in preference to all appropriative rights of later priority.

Aquatic ecosystem The stream channel (surface and subsurface), lake, spring, or wetland, and water resources, biotic communities, and habitat features that occur therein.

Base flood The flood level which has a one percent chance of occurring in any given year (also known as the 100-year flood).

Critical flood The flood level which has a 0.2 percent chance of occurring in any given year (also known as the 500-year flood).

Docket As used here, a file containing the documents associated with the legal establishment of a water right.

Doctrine of Prior Appropriation The principle in western water law that ascribes a preference right to the appropriator who first appropriates and beneficially uses water. Commonly described as "first in time, first in right."

Federal reserved water right As generally used, a judicially created water right originating in the U.S. Supreme Court decision in Winters v. United States 207 U. S. 564 (1908). In essence, when the federal government withdraws its land from the public domain and reserves it for a federal purpose, the government, by implication, reserves appurtenant water then unappropriated to the extent needed to accomplish the purpose of the reservation. This right vests on the date of the reservation and is superior to the rights of future appropriators. The **implied** reservation of water is inferred if the previously unappropriated waters are necessary to accomplish the purposes for which the reservation was created. The amount of water reserved is only that amount of water necessary to fulfill the purpose of the reservation. Another form of the federal reserved water right results from an **expressed** reservation of appurtenant unappropriated water by Congress when it creates a new reservation and explicitly makes a reservation of water.

Floodplain Lowland and relatively flat areas adjoining inland and coastal waters including flood-prone areas of offshore islands, and, at a minimum, areas subject to a one percent or greater chance of flooding in any given year. Extent of 100-year floods designates the "base floodplain." Similarly, extent of 500-year floods designates the "critical action floodplain."

Floodplain values Beneficial attributes and uses of floodplains, including wildlife habitat, groundwater recharge, hydrologic balance/buffering of flood flows, maintenance of the channel's hydraulic integrity, outdoor education, and recreation.

Hydropattern Spatial and temporal characteristics of water conditions (quantity, depth, and coverage) in a specified geographic region.

Instream flow right A right to a fixed or minimum flow amount, or a defined flow regime for in-situ purposes such as fish habitat protection. Generally, these rights are held by a governmental entity and purposes are delimited by statute.

Property That which belongs exclusively to one, including the right of use and enjoyment for lawful purposes.

Reasonable Use The concept, included as part of the doctrine of riparian water right, which allows for water use if, subsequent thereto, water is delivered to other riparians without "unreasonable" diminishment in quantity and/or quality.

Riparian water right A water right which is a right of private property vested exclusively in the owner of the abutting land for use only on that land. It is identified with realty, and is a part thereof.

Water quality Physical, chemical, radiological, microbiological, and biological characteristics of a water resource.

Water quality monitoring Systematic evaluation of water quality specifically designed to answer management questions relative to management goals and objectives.

Water right The property interest established in state statute and state and federal judicial determinations that attaches to a use of water.

Wetland A general definition is: Lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. More specific definitions related to NPS wetland inventory requirements and regulation under Section 404 of the Clean Water Act are presented in Aquatic Habitat Protection and Management, Section G, Wetlands Management, below.

POLICY AND PROGRAM OBJECTIVES

Policy regarding aquatic resources management is provided in the NPS Management Policies. Broadly stated, these policies require management of natural resources of the National Park System to maintain, rehabilitate, and perpetuate the inherent integrity of water resources and aquatic ecosystems. Specific management policies provide for protection of quality and quantity of surface water and groundwater (4:15-16), preservation of floodplains and wetlands (4:16-17), maintaining, protecting, and securing water rights (4:17), and protection of aquatic biological resources (4.5-14). Program objectives and specific guidance regarding these goals are presented in Program Guidance, below.

AUTHORITIES

In addition to the authorities discussed in Chapter 1, the primary federal laws governing aquatic resources management include the Clean Water Act, the National Environmental Policy Act, the Rivers and Harbors Act, the Endangered Species Act, the Wilderness Act, the Wild and Scenic Rivers Act, the Coastal Zone Management Act, and the Fish and Wildlife Coordination Act. Management of aquatic resources is further addressed in various provisions of the Estuary Protection Act, the Federal Power Act, the Resource Conservation and Recovery Act, the Comprehensive Environmental Response, Compensation, and Liability Act, the Safe Drinking Water Act, the Food Security Act of 1985, and the Coastal Barrier Resources Act.

Executive orders pertaining to the management of aquatic resources on federal lands include Executive Order 11988 (Floodplain Management), Executive Order 11990 (Protection of Wetlands),

and Executive Order 12088 (Pollution Control Standards). A summary of the pertinent provisions of the major federal legislative and regulatory authorities governing the management of aquatic and other natural resources in NPS units is found in several other Appendix A of this Guideline.

Regarding water rights, the NPS, under the Reserved Water Rights and Prior Appropriation Doctrines, obtains and uses water for park (reservation) purposes. When the Reservation Doctrine or other federal law does not apply, water rights are obtained in accordance with applicable state laws and procedures.

States, counties, and local water management districts may have laws and regulations pertaining to aquatic resource management in NPS units. For example, most states have established criteria, standards, and guidelines for erosion and sediment control, and a few states have recently enacted groundwater management laws. In general, it is NPS policy to comply with these laws and regulations.

RELATIONSHIP TO OTHER GUIDANCE

National legislation, external influences, and specific park legislation present special concerns and provide direction for management relating to water resources. In some cases the enabling legislation establishing the NPS unit will provide objectives or guidance pertaining to specific water resources-related issues. Other guidance may be found in several other sections of this Guideline, as well as in NPS-12, the Environmental Compliance guideline.

PROGRAM GUIDANCE

I. Water Resources Management

A. Water Quality Management

1. Water Quality Issues

Many units of the National Park System are confronted with threats of water pollution from sources within, as well as external to, their boundaries. The 1987 NPS Servicewide natural resources assessment identified 480 water quality issues affecting or potentially affecting 170 parks. The scope and extent of these water quality issues varied greatly, but the majority were related to surrounding land-use activities such as oil and gas development, mining, encroaching urbanization, industrial activity, agricultural practices, or land development (including sewage effluent discharge and landfill leaching). The severity of water quality degradation (of both surface and groundwater) and the constituents affected depend upon the type and the extent of the activity, watershed and aquifer characteristics, and effectiveness of mitigative measures. It should be noted that the majority of water quality issues identified in the assessment were associated with nonpoint sources of pollution (as opposed to point sources of pollution such as pipes or other discrete sources).

Information pertaining to constituents likely to be affected by specific types of activity can be found in Kunkle et al. (1987) and Galbraith (1980).

2. Policy and Objectives

Maintaining water in its natural condition, free of pollutants generated by human activity, is an important goal of NPS managers. The goal of the NPS as expressed in Management Policies is to preserve and protect entire ecosystems, an integral part of which are water and aquatic resources. In addition, the Clean Water Act, passed in 1972 and substantially amended in 1977 and 1987, was designed to restore and maintain the integrity of the nation's waters, including those of the National Park System.

The NPS Management Policies states that:

> The National Park Service will seek to perpetuate surface and groundwaters as integral components of park aquatic and terrestrial ecosystems....The National Park Service will seek to restore, maintain, or enhance the quality of all surface and groundwater within the parks consistent with the Clean Water Act (33 USC 1251 et seq.) and other applicable federal, state, and local laws and regulations. The quality of water originating within the boundaries of parks will be maintained through the following management actions:
>
> > Adequate sewage treatment and disposal will be provided for all public use and administrative facilities. Sewage treatment and disposal are subject to provision of Executive Order 12088, "Federal Compliance with Pollution Control Standards" (42 USC 4321).
> >
> > Human activities will be managed to control erosion.
> >
> > Direct pollution by livestock under commercial grazing permits will be prevented by eliminating streamside or lakeside corrals and pastures and associated watering sites on natural waters wherever possible.
> >
> > Fuel-burning watercraft and marina operations, placer mining, and other activities with high potential for water pollution will be regulated and controlled as necessary.
> >
> > Toxic substances, such as pesticides, petroleum products, and heavy metals, will be managed to minimize the risk of water contamination.
> >
> > The intensity of use will be regulated in certain areas and at certain areas and at certain times determined to be necessary based on water quality monitoring studies.

The following additional actions will be taken to protect the quality of water flowing through parks or along their boundaries:

> The National Park Service will enter into agreements or compacts with other agencies and governing bodies to secure their cooperation in avoiding degradation of water resources.
>
> Consistent with the rights of others, the Park Service will maintain a continuous vigilance by observing and monitoring upstream diversions, adjacent uses, and groundwater withdrawals and their effects on the occurrence, quantity, and quality of water necessary for the continued preservation of park biota and ecosystems.

The National Park Service will seek state support in helping to protect and enhance the quality of park water through special use classifications, such as outstanding resource waters. (4:15-16)

Managers should also petition (under section 1424(e) of the Safe Drinking Water Act) the EPA Regional Administrator for Sole Source Aquifer designation for aquifers supplying groundwater to park water supplies.

In addition to the Clean Water Act, water quality is protected by provisions of the Safe Drinking Water Act; the Resource Conservation and Recovery Act (RCRA); and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). For example, under the Safe Drinking Water Act, the Underground Injection Control Program prohibits the subsurface emplacement of fluids that could contaminate current or future underground sources of drinking water, and under RCRA, underground storage tanks are regulated to prevent leaking and possible contamination of the environment including surface and groundwater resources.

Section 319 of the Water Quality Act of 1987 requires the states to undertake studies to assess the status of nonpoint source pollution and to develop management programs for addressing this type of pollution. In most states, these management programs rely on the implementation of best management practices (BMPs), which are recommended practices to control nonpoint source pollution (e.g., erosion control practices) for agricultural, logging, and road construction activities. Of particular relevance to NPS managers, Section 319 also requires that federal development projects (e.g., park construction projects) be consistent with the states' nonpoint source pollution management programs. In order to minimize nonpoint source pollution in parks, BMPs should also be applied with respect to other NPS-administered land disturbing activities (e.g., agricultural, mining, and recreational activities).

3. Water Quality Standards

A primary means for protecting water quality under the Water Quality Act is the establishment of water quality standards. Generally, water quality standards are established by the states (though

subject to federal approval) and consist of two components. The first component determines the appropriate use of the water within a specific stream segment. Once the appropriate use has been established, water quality criteria for a variety of physical and chemical constituents (e.g., water temperature, pH, nutrient concentrations) are assigned that will protect the assigned use. These uses and criteria are then adopted as water quality standards. These standards are applicable to surface waters and, depending on the state water quality program, may also apply to groundwaters.

Water quality criteria developed to protect specific uses are updated periodically by the Environmental Protection Agency (EPA). New and revised criteria are published in the Federal Register, and summarized periodically in Quality Criteria for Water (EPA, 1986). Quality Criteria for Water, also known as "the Gold Book," recommends criteria for a state's Water Quality Standards. It is an important reference for natural resource managers dealing with water quality issues.

Water quality standards for drinking water are provided by the Safe Drinking Water Act. These National Primary Drinking Water Regulations (NPDWRs), for which states have primary enforcement responsibility, are updated periodically by EPA. New and revised standards are published in the Federal Register. As of January 1, 1989, the NPDWRs include 10 inorganic chemicals, 14 organic chemicals, turbidity, coliform bacteria, combined radium-226 and radium-228, gross alpha particle activity, and beta particle and photon radioactivity from manmade radionuclides. Additionally, secondary standards for various "non-toxic" chemicals are recommended. Additional information regarding water quality standards can be found in NPS-83, the Public Health Management guideline.

Because water quality standards vary from state to state, and constituent criteria vary from use to use, and use designations vary from water body to water body (and sometimes from reach to reach in a river or stream), NPS personnel at the park level should be familiar with specific state water quality standards pertaining to the water resources in and entering NPS parks. Specific actions include:

- participation in a state's required triennial review of water quality standards to assure that state standards adequately protect park aquatic resources,
- alerting the water resource coordinator, designated in each NPS region, to upstream point source discharge applications for National Pollutant Discharge Elimination System (NPDES) permits which could impact the quality of water within an NPS unit,
- encouraging states to apply effective anti-degradation standards and nonpoint source pollution policies to those stream segments most likely to affect park water resources,
- working with state, county, and local agencies to develop and implement appropriate nonpoint source pollution control practices on NPS lands and lands upstream from NPS units, and

- working with local, state, and federal agencies to implement applicable groundwater protection programs.

4. Water Quality Monitoring

Water quality monitoring is often required within NPS units in response to management concerns. An effective monitoring program requires initial planning efforts to identify potential water quality issues and precisely define park management objectives. Sampling design, data collection, data analysis, and reporting processes are strongly influenced by management's monitoring objectives. For NPS units, monitoring objectives almost always entail one or more of the following:

- evaluation of impacts caused by a particular water or land use or combination of water or land uses,

- evaluation of compliance with local, state, or federal standards or legal requirements, and

- gathering of baseline data to characterize existing water quality for general inventory, pre-existing (historical) conditions, or to establish long-term trends, using, for example, previous water gaging stations or groundwater monitoring wells.

When objectives are defined, water quality monitoring sampling design should proceed using the following six-step procedure (adapted from Sanders et al., 1983):

1. **Determine sampling site locations.** Carefully review all existing information, including the available literature, upstream land uses and associated point and nonpoint sources of pollution, delineation of watershed characteristics, and analysis of previously collected data, in order to determine the most appropriate sampling locations.

2. **Select water quality parameters and sampling frequencies.** Water quality parameters and sampling frequencies for NPS monitoring programs should be determined according to guidance provided by NPS-75, the Inventory and Monitoring Guideline (when completed), and with design consultation sought from water resource professionals familiar with monitoring programs in the local area. A further discussion of parameter selection has also been provided by Averett (1978).

3. **Choose methods needed to sample the selected parameters.** 40 CFR 136 provides a listing of methods approved by the EPA.

4. **Evaluate costs, logistics, quality control, and quality assurance needs**, and possible legal requirements (e.g., chain of custody if to be used for litigation) in order to select the most effective implementation strategy (i.e., via in-house, cooperative agreement, interagency agreement, contractor, certified laboratory, etc.).

5. **Determine methods of data analysis, storage, and retrieval** to be used. A discussion of this topic will be provided in the Natural Resource Data Management Handbook (when completed) and is also provided in Water Quality Surveys (UNESCO, 1978).

6. **Determine reports to be prepared** and how data will be used in decision-making.

Additionally, procedures for quality control should be incorporated in all monitoring plans. These procedures include the following:

- calibration of sampling equipment, recording field instruments, and flow measuring devices,
- selection of appropriate standard methods for sampling, preserving, storing, and transporting samples,
- assurance that the appropriate standard curves are completed to assure that the levels of detection and levels of accuracy are verified, and
- use of an inter-laboratory quality control program sufficient to meet EPA laboratory certification or the equivalent.

Recent changes brought about by the Water Quality Act of 1987 increase emphasis on the use of bioassays and biological monitoring. The appropriate use of bioassays and biological monitoring in units of the National Park System will be addressed in NPS-75, the Inventory and Monitoring guideline.

For surface water resources, most water quality monitoring programs should include concurrent discharge measurements. For groundwater resources, most water quality monitoring programs should include spring discharge measurements and periodic measurements of the depth to water in monitoring wells. When siting monitoring wells, it is important to identify the depth to and thickness of water-producing zones, the aquifer characteristics (geologic formation, transmissivity, and storage coefficient), other pertinent site characteristics (e.g., land surface elevation at well head), and well construction data. The constituent(s) for which water samples will be tested determines the type of well casing and screen that should be used for monitoring wells.

5. Cooperation with Other Agencies

Monitoring, regulation, and protection of water quality is a responsibility shared by many local, state, and federal agencies which have mandates for land use planning, natural resource management, and/or environmental protection. The NPS should work actively with these agencies to enhance program cooperation, efficiency, and effectiveness. Cooperative activities include (but are not limited to) the following:

- working with local, state, and federal agencies to implement applicable groundwater protection programs.

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Monitoring, regulation, and protection of water quality is a responsibility shared by many local, state, and federal agencies which have mandates for land use planning, natural resource management, and/or environmental protection. The NPS should work actively with these agencies to enhance program cooperation, efficiency, and effectiveness. Cooperative activities include (but are not limited to) the following:

- consulting with federal (e.g., U.S. Geological Survey and EPA), state, local, and Native American agencies in the design of complementary and effective monitoring networks,
- providing water quality monitoring data to the EPA's STORET system, which serves as the primary national repository for stream and lake water quality data,
- providing regulatory agencies with information regarding NPS compliance with point source and nonpoint source pollution control programs, and
- consulting with appropriate Native American, local, state, and federal agencies regarding planned upstream activities, permit applications, and water quality issues of concern to the NPS.

B. Water Quantity Management

1. Water Quantity Issues

Numerous water quantity issues, concerns, and needs have been identified as natural resource management issues in many NPS units. The 1987 NPS Servicewide natural resources assessment identified several types of water quantity issues, concerns, and needs of NPS managers. These include:

- lack of adequate and secure water rights,
- alteration of natural flow regimes,
- increased erosion and sedimentation resulting from changing land use activities (e.g., deforestation and urbanization),
- lowering of natural groundwater levels, and potential land subsidence, due to increased groundwater pumping,
- protection of natural geothermal resources (see Chapter 2, Geological Resources Management),
- need to provide adequate water for park operations and visitor use,
- lowering of natural groundwater level by accelerated stream bed erosion, and
- lowering of groundwater level by exotic streambank plants.

As demands for water continue to increase, it is imperative that superintendents maintain a constant awareness of proposals concerning upstream diversions, groundwater withdrawals, water resources development projects, urbanization, stormwater control projects, changes in land use, and weather modification (e.g., cloud seeding), which could affect park water resources.

2. Policy and Objectives

The NPS Management Policies states that:

> Water for the preservation, management, development, and use of the national park system will be obtained and used in accordance with legal authority and with due consideration for the needs of other water users. The National Park Service will generally obtain water rights by assertion of appropriative rights recognized under state law. Essential water rights will be purchased if unappropriated water is not otherwise available....The Service will assert claims to reserved federal water rights for water quantities determined to be the minimum amounts needed to protect the primary purposes of a given park. Where stated, primary purposes are those articulated in the legislation or proclamation establishing the park. Such legislation or proclamation establishes the priority date for the given park....The Park Service will use water efficiently, and in water-scarce areas, will use it frugally. (4:17)

NPS water delivery systems are to be designed to conserve water. (See Management Policies, 9:5)

3. Water Rights

a. Establishing Rights to Water

The NPS will establish rights to water in conformance with federal and state law and procedures. This includes, but is not limited to, the following:

> **Federal Reserved Water Rights.** The doctrine of federal reserved water rights was created with a decision of the U.S. Supreme Court in the 1907 case, Winters v. United States (207 U.S. 564 (1908)). Under this doctrine the government implicitly reserves sufficient amounts of water to carry out the purposes of a federal reservation. Federal reserved water rights have a priority as of the date of the reservation and are senior to the rights of future appropriators (Winters v. United States, supra.) Under this doctrine, what is reserved is only that amount necessary for the purposes of the reservation (Arizona v. California, 373 U.S. 546 (1963)); Winters v. United States, supra; Cappaert v. United States, 726 U.S. 128 (1976)). The doctrine has also been used by the Court to effect a permanent injunction to limit groundwater withdrawals that were adversely affecting the water level of a pool containing an endangered pupfish at Devil's Hole NM (Cappaert, supra).

Prior Appropriation and Riparian Water Rights. Water rights under state water law (prior appropriation and riparian rights) shall be secured where appropriate to accomplish National Park Service mandates.

Water rights vary from state to state, but fall into two general categories, riparian and appropriative. Riparian rights, recognized by most of the eastern states, originate from land ownership and are dependent upon contiguity of land to a body of water. The appropriative rights doctrine, adopted by most western states, is based on the concept of "first in time, first in right."

All rights to the use of water diverted to or used on federal lands within the National Park System by the United States of America (U.S.) or its concessioners, lessors, or permittees will be perfected (i.e., made to meet all state water rights requirements) in the name of the U.S. Where permitted by state law, the priority date requested on applications shall be the date on which the water was put to beneficial use.

Valid existing water rights of concessioner and land-use permittees on federal lands will be acquired by the U.S. as funds, legal authority, and management objectives permit. Water rights owned by inholders within parks will be acquired in connection with the acquisition of such private lands when practicable. Owners of land or interests in land within or adjacent to parks, under the NPS General Authorities Act of 1970, may be granted, by special use permit, the privilege of developing and using water or sources of water owned by the NPS only when it is administratively determined that the use of such water facilitates the management programs of the NPS. Such permits will not be issued if any other reasonable source of water is available. Specific conditions can be found in 16 USC 1a-2(e).

b. Determination of Water Rights and Needs

The water rights of a park are determined by federal and state law as described above. Until the U.S. is properly joined in a basin-wide general adjudication, federal reserved water rights are of undefined quantity and are not subject to loss due to nonuse. When properly joined, the United States must claim and defend its reserved rights in a court of competent jurisdiction or through negotiations either associated with the adjudication proceeding or in the development of a federal-state compact.

Appropriative rights are determined by state laws and procedures. The amount, purpose, location and place of use, and priority date associated with appropriative rights are included on the certificate or permit issued by the state. Riparian water rights are associated with land ownership and are dependent on contiguity of land to a body of water.

The NPS will prepare and maintain water rights dockets for all valid water rights of private parties (alien water rights) within or adjacent to units of the National Park System and for water rights of the U.S. Dockets will be established and maintained in accordance with instructions found in Creation and Maintenance of Water Rights Dockets for the National Park Service, which may be

obtained from the Water Resources Division. A master set of dockets will be maintained by the Water Resources Division and a companion set of dockets will be housed in the park.

Needs for water in a park include all water necessary to carry out the purposes for which the park was created as defined in the NPS Organic Act and the park's enabling legislation. Needs for water in the foreseeable future will be identified through the NPS planning process including the park's statement for management, general management plan, resource management plan, or water resource management plan.

c. Protecting Water Rights

In 1952, the U.S. Congress enacted the McCarran Amendment (43 USC 666) which consented to the U.S. becoming a party to state court adjudications relative to priority of water rights. The U.S. Supreme Court decision of March 24, 1971, confirmed that the U.S. is subject to adjudication proceedings in state courts, both as to reserved rights and acquired rights when the adjudication includes a river system. Therefore, the NPS must file and defend its water rights claims in a McCarran proceeding for each NPS unit located in the basin.

A limited waiver of Sovereign Immunity (McCarran Amendment, 66 Stat. 560, 43 USC 666) gives the consent of the United States to be joined as a defendant in any suit for the basin-wide general adjudication or administration of water rights. The Court has interpreted this consent to apply to water rights based on state water law and on the Doctrine of Federal Reserved Water Rights.

When properly joined, the United States must claim its water rights and offer proof to support this claim. In adjudication proceedings, the NPS must participate by supplying the Department of Justice with technical and other factual evidence as needed to protect claimed water rights.

Where the granting of a water right may now or in the foreseeable future conflict with NPS uses or needs for carrying out the purposes of the reservation, a protest will be made to the state agency responsible for water rights, notifying it that the issuance of such water rights is in conflict with those of the U.S. for NPS purposes. Similarly, when the granting of a water right may conflict with or injure existing riparian or appropriative water rights held by the U.S., a protest will be made to the state agency responsible for water rights.

The NPS will, in consultation with legal counsel as necessary, protest to the appropriate state official any application for a right to make a new appropriation of water or to alter an existing water right where approval of such an application will presently or in the future result in injury to any of the following:

- NPS adjudicated or unadjudicated water rights under state law,
- NPS adjudicated or unadjudicated reserved water rights, and

- present or future needs for water to accomplish its mandate.

d. Instream and Standing Water Requirements

Where water rights of the United States for NPS purposes are, or may be, injured by surface or groundwater storage or use, a quantification of instream flows and natural standing water levels may be necessary. Quantification of these amounts will generally be essential in water rights adjudications. Quantification may also be necessary in the preparation of a response to state or federally mandated environmental studies for actions that affect the environment; for example, construction of impoundments or diversions, and Federal Energy Regulatory Commission dam licensing and relicensing.

In those instances where federal reserved water rights do not apply or otherwise do not guarantee instream flows or natural standing water levels, protection may still be possible under state law. Generally, in such cases early quantification is desirable because the degree of protection is directly related to the date of appropriation; the earlier the appropriation the better the protection.

Other opportunities to protect instream flows and natural standing water levels may be found through conversion of existing or purchase rights under state water law to in-situ uses such as instream flow. Opportunities to accomplish NPS objectives under state water law may also be created through cooperative actions with state agencies.

In Riparian Doctrine states, the need for the quantification of instream flows and natural standing water levels may also arise consequent to water developments or other man-caused alterations of surface or groundwater hydrologic conditions. In these states the "reasonableness" of both the proposal and its effect will be considered by the court. Therefore, quantification should be related to the objectives identified in NPS statements for management.

4. Alterations to Natural Flow

Water resources in many NPS units have been affected by human-induced alterations to natural flow conditions other than those normally associated with water rights issues. Examples include the influence of cloud seeding, of reservoir releases on recreational activities, the impact of flood releases on endangered species, the alteration of aquatic habitat due to reservoir storage/drawdown cycles, and the establishment of a non-native coldwater fishery downstream from reservoir release sites. In addition, many urban NPS units experience discharge, erosion, and sedimentation patterns which have been altered by increases in stormwater runoff, resulting from continued growth and inadequate stormwater management in the adjacent watersheds.

Alterations to natural flow conditions may be a major concern in aquatic resources management as these changes often alter aquatic habitat. Issues and impacts relating to the influence of flow alteration on aquatic habitat is addressed in Aquatic Habitat Protection and Management, below. Natural resource managers are strongly encouraged to participate in the preparation and review

of other agencies' watershed management plans, stormwater management plans, etc. for areas which may not be located within the park boundary, but which may impact park aquatic resources that are a downstream watershed component.

5. Groundwater Quantity Issues and Management

As with surface water, groundwater may be a primary resource of the park that supports all other resources and ecosystems. In parks where groundwater sustains lakes, playas, springs, and cavern systems, it is critical to the continued existence of natural systems and associated park values. This may be especially true in arid regions where groundwater is the primary water supply for wildlife and vegetation.

NPS Management Policies limits groundwater withdrawal and consumptive use in a park to the amount that is absolutely necessary for the use and management of the park, and only if necessary studies show that these withdrawals will not significantly alter natural processes and ecosystems. It is especially important that the effects of groundwater withdrawals on park resources such as wetlands and springs be evaluated during these studies. When feasible, and appropriate, groundwater sources will be developed for park water supplies in lieu of, or to replace, surface water diversions in parks. In addition, all groundwater withdrawn from a unit for domestic uses is to be returned to the park's watershed.

Groundwater withdrawals and appropriations that occur adjacent to park boundaries can have a significant impact on groundwater levels, as related to well yields and spring flow, and natural resources within a park. These impacts may be especially significant in areas adjacent to large agricultural or mining operations where large groundwater withdrawals can lower groundwater levels over a broad area through land subsidence.

Park personnel should maintain an awareness of local groundwater conditions and uses, and, when appropriate, work cooperatively with federal, state, and local agencies in order to protect these resources. In many cases, a well-developed position documenting NPS concerns can influence other entities to adopt a course of action acceptable to all parties involved. Agreements, memoranda of understanding, or possibly legislation are avenues that can be used to attain park objectives.

6. Water Quantity Inventory and Monitoring

A water quantity inventory, including an assessment of water rights and status, where appropriate, is an essential component for aquatic resources management within an NPS unit. The inventory and assessment may vary in scope and detail depending on management's needs, but should conform with guidance presented in NPS-75, the Inventory and Monitoring guideline (when completed). In addition, a water quantity inventory and assessment should be an integral part of a park's resource management activities and be identified in a park's resource management plan.

The NPS should cooperate with the USGS and other federal and state agencies in monitoring surface water available in rivers, streams, and other water bodies, and flow of artesian wells, springs, and water levels in wells. However, in many cases, the park will need to install and operate an appropriate monitoring system to measure water quantities if such issues are of concern. Information regarding the design of adequate water quantity monitoring programs is contained in NPS-75, the Inventory and Monitoring guideline (in draft).

C. Water Resources Planning

1. Water Resources Planning Process

Water resource planning in the NPS is part of the natural resource planning process. If water resources constitute only a minor component of a park's natural resources, and if issues are straightforward with no suspected significant impacts, water resources may be addressed as a component of the resource management plan (RMP). In many parks, however, water resources are sufficiently important and the issues so complex or controversial that a separate water resource management plan (WRMP) is warranted. In these situations, the WRMP may be prepared as a separate action plan which has been identified in the RMP.

2. Water Resource Management Plans

The WRMP supports NPS's decision-making process related to the protection, conservation, use, and management of a park's water resources. The WRMP structures and uses information about the park's hydrologic resources to assist management in evaluating alternatives concerning water resources issues. The WRMP is a dynamic document that is revised periodically. In general, the WRMP provides a blueprint for the resolution of park water resources issues over a three to five year period.

Each WRMP will contain three major sections. These include:

1. **Background and Authority**

   This section of the plan provides background information regarding the park and water resources issues, concerns, and needs that instigated preparation of the WRMP. In particular, this section provides information on laws, regulations, and policies applicable to the park, the status of NPS planning activities for the park, and land status and uses of lands adjacent to the park. This section also states objectives concerning use and management of water in the park and lists specific water resources issues identified for evaluation in the plan.

2. **Hydrologic Environment**

This section of the plan provides sufficient information to characterize the hydrologic setting of the park and to describe the current condition and status of park water resources. Depending upon the hydrologic resources of the park and the water resources issues to be addressed, the description of the hydrologic environment may include information regarding physiography, climate, geology, surface water resources, groundwater resources, aquatic and riparian resources and habitat, water uses within the park, and water rights. Care should be taken to assure that information included on the hydrologic environment be properly cited. These references will provide a valuable source of water resources information that may later be used in project design and implementation.

3. **Water Resource Issues and Alternatives**

This section of the plan represents the action program of the planning effort. It includes specific project statements describing day-to-day operational activities and special projects necessary to address water resources issues facing the park. These activities and projects may consist of management, monitoring, interpretation, law enforcement specifically directed toward water resources protection, program administration, research, management studies, and mitigation/treatment actions. Each water resources management activity or project is addressed in a separate project statement clearly stating a water resources issue, concern, or need, identifying alternative actions and their probable impacts, assuring environmental compliance, and identifying a preferred alternative. The statement is sufficiently detailed to allow its incorporation into the resource management plan for subsequent funding and programming purposes.

Responsibility for preparation of the WRMP lies with the park. Specific direction, guidance, and technical support can be provided by regional offices and the Water Resources Division. It is strongly suggested that public review be incorporated as a component in the development of any action plan, as public support will generally be important in future plan implementation. Instructions for the Preparation of Water Resource Management Plans may be obtained from the Water Resources Division. (See also, Chapter 4, Resource Management Plan.)

II. Aquatic Biological Resources Management

A. Aquatic Biological Resource Issues

Freshwater systems are important reflections of the watersheds in which they are found. They can be characterized based on physical features, water quality, and biological attributes including species composition, diversity, distribution, abundance, and biomass. They include many types of habitats such as ponds,lakes, seeps, springs, streams, rivers, and wetlands.

In addition to community changes resulting from natural environmental and biological processes, aquatic systems can change because of impacts caused by human activities. For example, effects on water quality from contaminated atmospheric deposition or point and nonpoint pollution sources can result in reduced growth and reproductive success, and increased mortality of organisms. Simple changes in forest cover alter rates of movement of nitrogen, phosphorus, and other important materials in streams and influence downstream habitats. Changing watershed conditions can cause a lowering of the local groundwater table, which concurrently can cause perennial streams to become seasonally dry and a reduction or loss of spring flow. These changes may have far-reaching effects, including loss of riparian and wetland vegetation and associated riparian and aquatic habitat. Habitat destruction on lands adjacent to a park may seriously impact aquatic species if important local portions of species distribution are lost or reduced in reproductive potential, or if such impacts reduce the ability of migrating species to move freely through the area. Introductions of non-native species also are a potent force in changing populations of native species. Generally such changes are related to competitive interactions for food and space, but can also involve predation. Genetic contamination from hybridization with introduced fishes is another important consideration.

A common but subtle form of habitat modification is cultural eutrophication. This process is based upon human-induced increases in the rate of supply of nutrients used in plant growth. Cultural eutrophication occurs when naturally occurring sources of essential growth compounds are supplemented by new sources such as septic tank effluent, soil erosion, fertilizer runoff, domestic animal wastes, landfill leachate, urban runoff, or any point or nonpoint sources which will stimulate plant growth. Park operations can contribute to this process, and training of park staff is appropriate in areas with potential for impacts on water resources and their biota.

The first indications of increased nutrient supply are usually increased algal growth and reduced water clarity. Changes in algal species often accompany new levels of nutrient influx; this species change often influences changes in the zooplankton community which is composed of very selective algal grazers. Changes in species of zooplankton in turn affect the diet of predatory fish, and so on. Some algae associated with high nutrient environments also exude toxins which further disturb the higher community structure (and can affect swimmers). Odors and extensive vegetation mats are common as are increased weed development in lakes and streams. Dense weed beds preclude swimming, boating, and fishing. Long-term implications are reduced lifespan of affected lake basins and weedy, turbid waters replacing clear-water habitats.

Long-term preservation dictates that great care be taken to limit any activities, operations, or developments which may increase the delivery of nutrients to natural waters and their inhabitants.

B. Management Needs and Actions

Human activities can decidedly alter natural patterns of variation, in populations of aquatic biota producing either artificially luxuriant growth or impaired survivorship. Although changes in some

aquatic biological resources may be immediately evident (e.g., fish kills), others occur over many years. A major constraint in protecting aquatic systems is that changes are often gradual, occurring over periods often longer than the usual tenure of superintendents or resource managers. Therefore, a solid inventory and monitoring program coupled with sound documentation and data management practices are mandatory for successful management and preservation of resources.

1. Inventory and Assessment of Park Resources

Problems with aquatic resources are usually recognized by loss of some populations or overabundance of others. Generally, little historical information is available, which makes assessment of changes or prosecution for relief from disturbance difficult. Necessary components of prudent management include knowledge and understanding of the range of aquatic biological resources present, and detailed and replicable data, including reference collections, concerning presence and distribution of major species. Information pertaining to the design of inventory and monitoring programs for aquatic biological resources may be found in NPS-75, the Inventory and Monitoring guideline (when completed).

Knowledge of life histories, seasonal cycles, and interrelationships among major species is a major element of active management. Vulnerabilities and requirements of each life stage, especially critical events such as spawning, migration, and aestivation should be known, so that current park conditions that might influence species success or failure can be identified.

Structure and organization of natural communities can be altered severely by non-native species. Many superintendents have inherited a legacy of introduced aquatic species, the impacts of which are little known. Effects of fish introductions may be seen in changes in zooplankton communities, phytoplankton communities (which are grazed differentially by different-sized zooplankton--size being a factor in selection by fish), and macroinvertebrates, as well as in competition with native fish species. Similarly, removal of top native predators, as by fishing, results in other changes in the community structure (see also Chapter 3, Fishing).

2. Monitoring

Since aquatic biological resources are highly variable, distinguishing natural from human-induced changes requires solid information over long periods of time. Precise measurements of appropriate variables are required, a program that requires diligence, continuity, and sustained management support. Although all baseline data are priceless (in that historic levels can never be fully captured afterwards), great care in choosing species, diversity indices, or general monitoring protocol must be exercised. Frequent analyses of data are required to assure that information gained meets monitoring objectives and supports management needs. Monitoring generates new understanding and new questions, and can measure results of management actions when implemented.

3. Impact Assessment

Fluctuations in population levels through death, immigration, emigration, or changes in growth and reproductive success may occur for many reasons. These changes may be natural or human-induced. An impact assessment should include an evaluation of weather patterns, alterations in physical habitat, changes in land use and management, changes in water quality (including nutrients, suspended solids, toxic chemicals, dissolved oxygen levels/temperature), changes in flow regime, and competition from introduced species. Pathogens may be responsible for, or indicative of, other stresses.

In conducting an assessment of an existing impact, the natural resource specialist should take care to provide proper documentation of all observations and events. Further analysis of an impact may require the early involvement of research or extension services provided by the park science program, the regional science program, and through the appropriate divisions of the Washington Office Natural Resources Directorate.

4. Research

Research can provide an understanding of aquatic biological resources and of the specific roles of individual species in aquatic communities. Information on life cycles and organism vulnerabilities often must be site-specific because of the powerful influence of habitat. Results from intense studies in one habitat may or may not be reliably applied to another. Often applicability of information from one population to another is a matter of professional judgment and sometimes litigation. Site specific data should be obtained to describe, understand, and protect aquatic biological resources.

III. Aquatic Habitat Protection and Management

A. Introduction

Objectives of this section are to inform superintendents and resource managers of the kinds of park aquatic habitats that must be protected, the ecological factors governing those habitats, and internal and external activities that impact aquatic systems. Wetlands and floodplains are aquatic habitats subject to specific executive and legislative mandates and NPS guidelines. Specific inventory, planning, and compliance requirements relating to these habitats are also discussed.

B. Policy and Objectives

With respect to aquatic habitats, the NPS seeks to:

- eliminate human-induced impacts on aquatic habitats,
- limit effects and mitigate damage if impacts are unavoidable,

- maintain and restore aquatic habitats to protect their ecological and aesthetic character and dependent animal and plant communities, and

- minimize economic costs to developments from flood hazards.

C. Aquatic Habitats

NPS units are located across a wide latitudinal gradient and within a broad range of physiographic regions. Aquatic habitats thus range from tundra ponds, which may be ice-free for only a few months each year, to subtropical marshes and swamps which never freeze. Lakes and rivers are obvious aquatic habitats to be protected, while other, less conspicuous, yet functionally important aquatic habitats may not receive the same consideration. Listed below are major classes of aquatic habitats included in NPS units.

- Lakes and ponds, including tundra pools, vernal ponds, inter-dune pools, caldera lakes, kettle lakes and tarns, oxbows and guts, pothole lakes, alkali or inland saline ponds, and playas. Reservoirs created for flood control, water supply, or hydropower are manmade habitats included in some parks.

- Permanent and intermittent rivers and streams, including sub-surface watercourses through caverns, and tidal freshwater and brackish water channels. Waterfalls along river courses create micro-habitats and attract visitor interest in many parks. Canals are manmade habitats included in some NPS parks.

- Springs and seeps, which are driven by groundwater, include desert spring pools. Many are home to endemic aquatic taxa and some have historic (cultural) significance.

- Geysers and hot springs driven by geothermal energy.

- Floodplain/riparian habitats, such as bottomland hardwood swamps and cypress swamps.

- Other wetlands with tree cover, such as cedar swamps, cypress domes, alder/willow thickets, and lakeshore swamps.

- Fresh and brackish water marshes dominated by sedges and grasses, salt-marshes, tule marsh, and sloughs.

- Northern peatlands (bogs, heaths, and fens), pocosins, and muskeg.

- Glaciers and their associated subglacial flows.

- Coastal floodplains and wetlands.

D. Physical and Ecological Factors

The nature of aquatic habitats and their biotic dependents is defined by the balance of water quantity and quality characteristics, physiographic and biotic factors, and episodic events such as fire and hurricanes. A shift in the balance of any major governing factors may lead to drastic changes in habitat type, with corresponding changes in the biotic community. The influence of water quality, water quantity, and other factors on aquatic habitats is discussed below.

Water quantity is a primary factor governing aquatic habitats. Hydrologic regimes, that is, the seasonality, quantity, and distribution of water amounts, vary according to changing patterns in rainfall in a watershed. Areal coverage, timing, and duration of inundation (hydropattern) are critical in maintaining marsh, swamp, bog, and lake systems. The water budget, that is, total input and losses of water within a habitat, is closely related to hydropattern. Flow velocity and seasonal water-level requirements must also be considered for river and stream habitats.

Water chemistry and related physico-chemical properties affect the capacity of aquatic habitats to support life. Nutrient and inorganic ion concentrations determine, in large part, the productivity of the system. Sediment load and turbidity affect rates of photosynthesis, quality of spawning sites, success of filter-feeding and sight-feeding organisms, etc. Salinity, pH, dissolved oxygen, and temperature are important in determining animal communities of a habitat. Many constituents are seasonally or annually variable, and many result from the unique combination of physical, geographical, and chemical characteristics of the drainage basin. Natural variability among aquatic habitat types is often extreme. For example, nutrient levels in bog waters are very low compared with a floodplain swamp; sediment load and turbidity are high in streams receiving glacial meltwaters compared with levels in Everglades marshes.

Physical aspects of aquatic habitats are shaped by geological and climatic influences. These influences may be prolonged (e.g., weathering or uplifting of landforms), or immediate (e.g., vulcanism, earthquakes, or hurricanes). Processes of stream-channel cutting, weathering and uplifting, storm disturbance, long-shore currents and tides create or influence habitat characteristics such as stream meanders or braids, riffle/pool complexes, substrate types and locations, and waterfalls. These physical aspects often determine composition of the aquatic biological community, distributions of the organisms, and their spawning, nursery, feeding, and wintering sites.

Biotic communities of aquatic habitats also alter habitat characteristics. The vegetation community often creates the substrate of the habitat (e.g., peat formed by Sphagnum in bogs or by sawgrass in the Everglades). Further, plants may also influence chemical components and fluxes in waters and soils. Animals such as the beaver and alligator modify wetland habitats by damming watercourses or lowering soil elevations, and thus influence other vegetation and animal species. The addition of animals or plants to an aquatic habitat in which they are not native (sometimes termed "species pollution") often changes the ecological balance of the habitat.

E. Impacts on Aquatic Habitats

Aquatic habitat characteristics must remain within a given range of natural variation to support biotic communities adapted to that range. Human activities which shift these characteristics outside the natural range of variability often cause habitat degradation and changes in species composition or abundance. In addition, recreational and aesthetic qualities of wetlands are related to many of the following factors and are an important contribution to a quality visitor experience. Waterfalls with too little flow because of upstream diversion, former white-water river rapids drowned by reservoirs, polluted waters, the use of ski boats and jet skis, or scenic views obscured by woody vegetation formerly suppressed by fires dampen visitor enjoyment of the park. This section discusses activities which affect aquatic systems, mechanisms by which they do so, and resultant changes in the system.

1. Water Quality: Nutrients

Nutrient additions within parks may issue from human waste from backcountry operations and campgrounds, sewage-treatment plants, soil erosion, lawn maintenance, garbage dumps, and fish-cleaning sites. External activities include deforestation, storm-sewer drainage, agricultural/urban runoff, sewage treatment outfalls, and landfill leaching. Nutrient additions change animal and plant communities, increase dissolved oxygen demand causing animal mortality, increase organic deposition, and affect aesthetics.

2. Water Quality: Pesticides

Some pesticides accumulate in aquatic habitats where they, or their breakdown products, undergo bio-amplification (i.e., increased concentration as they proceed up the food chain). Pesticides have been shown to cause dramatic declines in some top-level predator populations, and may be responsible for less obvious, chronic effects on wildlife.

3. Water Quality: Atmospheric Deposition

Parks are often located in areas where water resources have low buffering capacity, and are subject to damage if acidic atmospheric deposition depletes the natural buffering capability. In the eastern United States, many parks containing significant water resources have received increasing acidic atmospheric loading over the last 40 years, leading to decreased pH and increased sulfate and heavy metals concentrations. In the western United States, many parks contain large numbers of low-alkalinity lakes and streams which often occur in glaciated, high elevation alpine and subalpine zones. In these areas, slopes are typically steep, watersheds are small, soils are often thin and acidic, and the water resources subsequently are sensitive to increasing acidic atmospheric deposition. Acidification not only changes ambient water quality, but may also have far-reaching biological impacts, including reduced fecundity and the elimination of acid-sensitive species in affected waters.

4. Water Quality: Hydrocarbons and Toxics

Other hydrocarbons and toxic chemicals are used in fueling and maintenance operations, and result from minerals development. Leaking underground fuel tanks and marina operations may pollute surface and groundwater. Oil spills and acid drainage from mineral-mining sites also cause mortality of plants and wildlife in wetlands and floodplains. Chemicals, including solvents, paints, tars, wood preservatives, and detergents, used in maintenance, are often toxic.

5. Water Quality: Physico-chemical Constituents

Physico-chemical factors in aquatic habitats, such as pH, temperature, dissolved oxygen, and turbidity are affected by human activities. Activities that increase nutrient input may also result in increased turbidity, as do developments that remove riparian vegetation, such as logging, grazing, road-building, construction, placer mining, and farming. Irrigation in arid areas increases soil salinity and often concentrates chemicals at toxic levels. Park wildlife may be affected when using such areas. Related to removal of riparian vegetation and tree cover on slopes are increases in average water temperatures and sediment loads, and changes in dissolved ion concentrations and photosynthetic rates. Even when those activities are external, but occur within the watershed of park aquatic habitats, problems should be anticipated.

6. Water Quantity: Hydropattern Alterations

Water removal from park aquatic habitats results mainly from external activities. Withdrawals from municipal and agricultural wells may lower area groundwater levels, with subsequent wetland impacts, flow reductions in springs or seeps, or similar impacts in other aquatic habitats. Flow pattern changes may also occur because of land use alterations (e.g., deforestation, development) within a watershed, potentially causing more flash-flooding, less groundwater recharge, and sometimes seasonal changes in water availability. In coastal areas, removal of fresh water may allow salt water to intrude into groundwater and soils. Reservoirs in park watersheds withhold and divert waters from parks, change natural flooding cycles, and alter downstream nutrient regimes. Thermal-energy developments near park boundaries may impact timing and degree of geyser displays and hot-spring flows.

Reservoirs, water-control structures, and hydroelectric dams may provide flows to the park at inappropriate times of year or in inadequate or overwhelming quantities, with temperatures or other factors outside of the natural range. Areal distribution of these flows may also be unnatural, thereby affecting inundation patterns, and the flows may even be directed to areas outside of normal drainage basins. Delivery schedules may be maintained such that natural water fluctuations in marshes, swamps, and rivers are stifled, or in the case of lakes, may be exaggerated beyond normal limits.

Internal park activities such as bridge, roadway, and building projects may upset the balance of water flow and hydropattern in aquatic habitats by reducing connections between wetland areas, by

direct mortality of wetland animals crossing roadways, by impeding migrations, and by changing current patterns and siltation.

All of these impacts can affect parks and have been shown to cause changes in aquatic communities; some changes have been subtle, and others dramatic, as in the direct mortality of the biota or effects on animal nesting success. Many communities depend upon the predictability of seasonal and annual environmental conditions, so that any activity that interferes with that predictability decreases the ability of the community to respond properly.

7. Physical Modifications

Physical modifications of aquatic habitats issue from actions like streambed channelization, dredge or fill operations, gravel removal and mining, and jetty construction. Those actions produce changes in the physical parameters of aquatic habitats, including water depths, current speed, sediment transport, and turbidity. The results are reduced habitat and species diversity, shifts in organismal abundance and distribution, and changes in the rates and locations of beach-building and erosion. Mineral development in and near parks physically alters floodplain and wetland habitats or changes water flow or circulation patterns by the construction of drilling pads, coffer dams, and placer operations. Timbering along park streams often results in streambed obstruction by fallen trees and slash, which can disrupt fish spawning and migration patterns. Unregulated or improperly placed culverts, dams, and weirs have similar impacts.

8. Biotic Factors

Animal harvest by fishing, hunting, and trapping occurs in many parks. These topics are discussed in Chapter 3. However, removal of animals from aquatic systems may affect ecosystem function and structure.

Related to harvesting is the purposeful introduction of animals for sport. Exotic sport fishes and foraging species stocked into waters outside parks by state or federal agencies have often colonized park habitats. Many have been shown to displace native fish species and to disrupt planktonic communities and food webs. A common practice in the past, fish stocking still occurs in a few parks, most commonly where special use zones (often reservoirs) are designated by park legislation for "active fisheries management." Some non-native species introduced outside of park waters to control aquatic plants have also colonized parks.

9. Other Impacts

The use of recreational vehicles in wetland and riparian habitats disturbs the physical and vegetational structure and often causes direct animal mortality. Disturbances in aquatic habitats may remain visible for decades, affecting habitat aesthetics and function.

Inholdings and structures, such as hunting camps in Big Cypress National Preserve, modify their surroundings and may add sewage and other wastes to aquatic habitats. Access to these areas may impact park habitats and wildlife.

F. Floodplain Management

Floodplains are flood-prone lands that border inland and coastal waters and are created primarily by the transport and deposition of bedload, sediment, and organic materials during high waters. In the United States there are more than 50,000 square miles of flood-prone land (Dunne and Leopold, 1978).

Floodplains can be divided into three general descriptive categories: riverine, coastal, and special areas (43 FR 6030). Riverine floodplains are valley areas that are periodically inundated by floodwater from adjacent perennial or intermittent streams or rivers of any size. Flooding in river floodplain areas can result from excessive precipitation and runoff, natural or manmade channel obstruction, or reservoir releases. Riverine floodplains are subject to frequent flooding; generally floods that overtop river banks occur every 1 to 2 years (Leopold et al., 1964).

In addition to conventional flooding in riverine floodplains, changes in floodplains from debris flows in steep gradient ephemeral channels of some western parks present special situations in floodplain management. Debris flows are not generally predictable using normal flood forecasting procedures, yet they can sometimes exceed floods from runoff in both peak volume and destructiveness. Recent research by Webb et al. (1987) indicates that the occurrence of debris flows in Grand Canyon National Park (and presumably other western parks) are more frequent than previously thought.

Stream channels located in glacial outwash areas or in aggrading landscapes such as alluvial fans present additional problems. Streams in these areas often transport enormous sediment bedloads and can rapidly inundate or undermine a site through rapid lateral erosion. Problems with locating roads or facilities near such streams occur in both desert parks (alluvial fans) and in Alaska (glacial outwash).

Coastal floodplains border lakes, estuaries, or oceans. Flooding in coastal floodplains is due to landward flows caused by unusually high tides, waves created from high winds, storm surges, or tsunamis.

Special floodplain areas include sheet flow or shallow flooding areas and wetlands in which the paths of flooding are unpredictable and indeterminate.

Floodplains are valuable yet often overlooked components of park ecosystems. They serve important functions such as natural moderation of floods, water quality maintenance associated with filtration of waters through vegetation and gravel, sediment control, groundwater recharge, habitat for biota, areas for outdoor recreation and education, and natural beauty.

1. Mandates and Guidance

Mandates and guidance for National Park System floodplain protection is found in Executive Order 11988, Floodplain Management (42 FR 26951; May 24, 1977). In addition, floodplain guidance is found in the Coastal Zone Management Act, which has certain requirements for consistency with approved state coastal zone management programs; Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act, which require U.S. Army Corps of Engineers permits for construction and disposal of dredged material in waters of the United States; the Fish and Wildlife Coordination Act, which requires that equal consideration be given to wildlife when proposing to impound, divert, deepen, control, or modify any stream or other water; the Wild and Scenic Rivers Act and the Endangered Species Act. Procedures for compliance with these laws is presented in NPS-12, the Environmental Compliance guideline.

Executive Order 11988 was issued in furtherance of the National Environmental Policy Act, the National Flood Insurance Act of 1968, as amended (42 USC 4001 et seq.), and the Flood Disaster Protection Act of 1973. Executive Order 11988 emphasizes the environmental aspects of floodplain management. The Order requires that all federal agencies avoid, to the extent practicable, the adverse impacts associated with the occupancy and modification of floodplains and avoid direct and indirect support of floodplain development if there is a practicable alternative. The preferred method for satisfying this requirement is to avoid actions on the base floodplain (100-year floodplain). If an action must occur on the base floodplain, the Order requires that agencies minimize potential harm to people and property and to natural and beneficial floodplain values.

Guidelines for implementing Executive Order 11988 were published by the Water Resources Council in 1978 (43 FR 6030). These guidelines provide broad guidance in the interpretation of the Executive Order to assist each agency in developing its own procedures for compliance with the Order. Each agency is to reflect the conceptual framework of floodplain management as set out in the Unified National Program for Floodplain Management (1976) prepared by the Water Resources Council. The NPS published Floodplain Management and Wetland Protection Guidelines (hereafter, "NPS Floodplain and Wetland Guidelines") in 1980, with revisions in 1982 (45 FR 35916, May 28, 1980; 47 FR 36718, Aug. 23, 1982). These guidelines set forth NPS procedures for implementing Executive Order 11988 for Floodplain Management within the National Park System.

In addition to the NPS Floodplain and Wetland Guidelines, other NPS guidelines describe activities and procedures associated with floodplain management. These include:

- NPS-2, the Planning Process guideline. Provides guidance on the preparation of general management plans and other park planning documents. In many cases, the actions proposed in park planning documents require floodplain evaluation.

- NPS-12, the Environmental Compliance guideline. Includes the final procedures concerning compliance with legislative and executive requirements which relate to NPS planning activities, including compliance with Executive Order 11988.

- NPS-18, the Fire Management guideline. Provides guidance on fire management which can affect floodplains and freshwater resources.

- NPS-28, the Cultural Resources Management guideline. Provides direction for the management of cultural resources, including guidance for management of cultural resources in floodplains, and flood loss protection for storage of cultural artifacts.

- NPS-40, the Dams and Appurtenant Work, Maintenance, Operation and Safety guideline. Provides an outline of responsibilities of the NPS in the planning, design, construction, and maintenance of dams and a related discussion on floodplain management.

- NPS-75, the Inventory and Monitoring guideline (in preparation). Provides guidance on inventorying and monitoring park natural resources, including water resources.

2. Responsibilities

A detailed listing of NPS responsibilities in regard to floodplain management is presented in 45 FR 35916, Section 9.

3. Floodplain Planning and Compliance Procedures

The goal of NPS floodplain management is to protect riverine, coastal, and special types of floodplains and floodplain functions, and the natural and beneficial values associated with floodplains. A brief summary of procedures outlined in the NPS Floodplain Guidelines is provided below. The NPS will identify floodplain and flood hazard areas in parks that are subject to public use or development and where the hazard or impact of human activities would be greatest (Section 6.B). The NPS will delineate base floodplains for the areas of concern identified in the preceding paragraph. Data on base floodplains are available from a variety of sources. A general listing of these sources is presented below.

Agency	Floodplain maps and profiles		Technical Assistance Services
	Riverine	Coastal	
Department of Agriculture: Soil Conservation Service	X	X	X
Department of the Army: Corps of Engineers	X	X	X
Department of Commerce: National Oceanic and Atmospheric Administration		X	X
Department of Housing and Urban Development: Federal Housing Administration	X	X	X
Department of the Interior: Geological Survey	X	X	X
Bureau of Land Management	X	X	
Bureau of Reclamation	X		X
Federal Emergency Management Agency	X	X	X
Tennessee Valley Authority	X		X
Delaware River Basin Commission	X	X	X
Susquehanna River Basin Commission States (Varies from state to state)	X		X

If base floodplain information is inadequate or not available, the NPS or contractors will develop data sufficient to determine the base floodplain (see Flood Monitoring and Mapping, below).

Proposed actions that might affect park floodplains for which there are no floodplain data will be addressed on a case by case basis. It must be determined if a proposed action is located in or could affect a floodplain. For many small projects, the cost of determining precise base floodplain boundaries is prohibitive in relation to the action. For such actions, the NPS can choose to use a worst case analysis by assuming the project is in or will affect the base floodplain. Steps for determining if a proposed action is in or could affect a floodplain are outlined in Section 6.D.1.

All NPS actions subject to compliance with Executive Order 11988 will be evaluated in an appropriate environmental document (Environmental Assessment or Environmental Impact Statement). The NEPA process ensures opportunities for public participation in decisions concerning floodplains. Requirements for the public review process are outlined in Section 6.D.2.

Certain day-to-day, NPS administrative and operational activities may be categorically excluded or require modified approaches to compliance with Executive Order 11988. NEPA categorical exclusions are listed in the Departmental Manual (516 DM 2, Appendix 1 and 516 DM 6, Appendix 7). Certain NPS actions may also be excepted from compliance with the Executive Order, for example, scenic overlooks and foot trails (Section 5.B.2).

When the NPS takes emergency actions essential to protect property and public health and safety, a modified application of the Executive Order is required. All possible steps to mitigate potential impacts of such emergency actions will be taken, considering the need for rapid action in emergency situations. (See also, Chapter 4, Emergency Management.)

The NPS will identify and evaluate practicable alternatives to locating in the base floodplain. If a proposed action involves adverse impacts on a floodplain, a Statement of Findings (Section D.3.c) must be prepared documenting the rationale for the determination that there is no practicable alternative to locating in or causing impact on the floodplain. Section 6.D.3 describes the requirements of identifying and evaluating alternatives for actions involving floodplains.

The environmental documents prepared for proposed actions and alternatives to each action located in floodplains will identify potential impacts associated with occupation and modification of floodplains. Both flood hazard factors and natural value factors will be analyzed in these environmental documents. A description of the factors to be analyzed and the approach to discussing floodplain impacts is presented in Section 6.D.4.

In addition to following the NPS Floodplain and Wetland Guidelines, NPS managers must also comply with other applicable federal, state, and local regulations governing floodplains.

Where activities in floodplains cannot be avoided, compliance with both EO 11988 and NPS Floodplain Management and Wetland Protection Guidelines can be met by either (1) structural

Portions of floodplains are classified as wetlands by the FWS (Cowardin et al. 1979). Further information on this classification system, on-site evaluation procedures, wetlands compliance and the National Wetlands Inventory is presented under Wetlands Management, below.

4. Managing Floodplain Threats From External Sources

Activities outside park boundaries can cause impacts on park coastal, riverine, and special area floodplains. The superintendent will work to minimize potential floodplain impacts through active coordination and involvement in the planning and implementation of actions external to, yet affecting, park floodplain values.

Activities external to the park will often require EISs or EAs because major federal actions, including permitting by federal agencies, are part of the activity. In these cases the NEPA process would occur and the NPS would be involved in the process through scoping, as a cooperating agency, as a consultant, or through comment and public hearings (NPS-12). Nonfederal actions, for the most part, will also trigger some type of review according to state or local zoning or permit requirements.

Some external actions might occur that would threaten park floodplain systems, but which NPS might not discover until after the fact. Examples include an action that is categorically excluded for NEPA compliance by another agency; inadequate public notice during the NEPA process or state or local review processes; actions on private or Native lands that do not trigger NEPA or other public review processes; and illegal activities. For these reasons, it is important that NPS managers be alert for actions external to the park that would threaten the natural floodplain values or the health and safety of NPS visitors and facilities.

NPS managers will monitor park floodplain values subject to external threats. Monitoring programs will be developed in resource management plans or water resource management plans. These monitoring programs should measure and evaluate appropriate parameters associated with the floodplain threats such as waterbody morphometry, floodplain topography, floodplain vegetation, water quality and quantity, scenic values, and hazard aspects.

5. Flood Monitoring and Mapping

Most floodplain mapping in the U.S. has been done near major population centers to provide information for the protection of life and property. For the most part, parks are located far from these urban centers and therefore very little floodplain mapping has been completed in or near parks.

An engineering survey and the subsequent development of a floodplain map can be a time-consuming and expensive project. And when complete, these detailed floodplain maps still contain a degree of uncertainty; the boundary of a 100-year flood may be in error by a hundred to several thousand feet in a horizontal direction (Dunne and Leopold, 1978).

Yet, there are several simpler, less expensive methods to collect some basic floodplain data for use in initial identification of areas of concern, in small projects where project cost does not justify a full engineering survey, or where floodplain information is needed for interpretation or backcountry recommendations.

NPS staff, in association with other state and federal agency specialists, can collect some of this basic floodplain information. Floods can be mapped using a combination of fieldwork and aerial-photography interpretation of various topographic, soil, and botanical features; these features can be correlated with known floods (Wolman, 1971). Hydrograph analysis, historical flood records, historical photographs, and analysis of stage and precipitation records can also indicate the extent of flooding and floodplain boundaries.

In evaluating these flood indicators consideration needs to be given to changes in flood hydrology that have occurred because of urbanization, water control projects, and other alterations in the watershed or coastal area. Other factors to consider in evaluating indicators of flood boundaries are natural, catastrophic events that may have caused flooding in the past, such as volcanic activity, earthquakes, hurricanes, and glacial outburst events.

Park staff can gather useful information immediately after a flood event such as records of debris lines on the ground, trees, and stable reference points; records of high-water marks at stable surveyed reference points where water velocity was low; photo-documentation of post-flood effects, and interviews with people knowledgeable about the flood.

G. Wetlands Management

Scientists, natural resource managers, and regulatory agencies have developed many definitions of "wetlands" to suit their particular focuses. One of the most comprehensive and widely accepted wetland definitions is that used by the U.S. Fish and Wildlife Service (FWS) as outlined in "Classification of Wetlands and Deepwater Habitats of the United States" (Cowardin et al., 1979):

> "...lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification, wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year."

That is, a site is a wetland if it meets at least one of three diagnostic vegetation, soil, or hydrologic characteristics. This definition includes the well-known vegetated wetland types such as marshes, bogs, and swamps. In addition, it includes wetlands without soil such as "rocky shores" or streambeds and nonvegetated wetlands such as mudflats or some gravel-beach systems. (See Definitive Wetland Delineation, below, for a definition of "jurisdictional wetlands.")

Wetlands are crucial components of most ecosystems managed by the NPS. For example, many wetlands generate high levels of net primary production (plant tissue) compared with upland systems.

Grazing and decomposition processes in wetlands convert this plant tissue into nutrients and detritus usable as food by higher organisms. Nutrients and detritus may also be flushed from wetlands into downstream systems, thereby increasing riverine and estuarine productivity. Additional beneficial functions and values of wetlands include fish and wildlife habitat, flood control, erosion control, and maintenance of water quality. Wetlands also constitute significant aesthetic, recreational, archeological, and historical resources (Sather and Smith, 1984).

Wetlands are an imperiled natural resource, with less than half the acreage now that existed in the lower 48 states prior to European settlement. Although some regulatory measures have been instituted to slow the decline, losses continue at a rate of 300,000-450,000 acres annually (Feierabend and Zelzany, 1987).

1. Authorities and Guidance

Specific authorities for protection of NPS wetland resources are found primarily in the NPS Organic Act, the Clean Water Act, the National Environmental Policy Act, and Executive Order 11990, Protection of Wetlands. The NPS Floodplain Management and Wetland Protection Guidelines provide guidance for compliance with Executive Order 11990. In addition, the Rivers and Harbors Appropriation Act, the Endangered Species Act, the Wild and Scenic Rivers Act, the Coastal Zone Management Act, the Fish and Wildlife Coordination Act, the Food Security Act of 1985 (Swampbuster), the Coastal Barrier Resources Act, Executive Order 11988, Floodplain Management, and other federal, state, and local laws and regulations affect NPS wetlands management and compliance.

2. Responsibilities

A detailed listing of NPS responsibilities in regard to wetland protection are presented in the NPS Floodplain Management and Wetland Protection Guidelines, 45 FR 35916, Section 9.

3. Wetland Planning and Compliance Procedures

Parks must comply fully with the wetlands planning, compliance, and management guidance found in the NPS Floodplain Management and Wetland Protection Guidelines. The following material should be viewed as supplemental to those guidelines.

NPS managers must strive to achieve a goal of "no-net-loss of wetlands" as defined by both acreage and function. The Floodplain and Wetland Guidelines outline a multi-faceted strategy for wetlands protection and management that contains many of the elements of a no-net-loss program.

1. Parks are required to inventory wetland resources as part of the planning process.

2. Parks are required to avoid any action with the potential for adversely impacting wetlands where there is a "practicable alternative." (Such adverse impacts may result from actions in wetlands, from actions outside wetlands but still having impacts upon them, or from actions which otherwise, directly or indirectly, support wetland development.)

3. Where no such practicable alternatives exist (including "no action"), proposed actions must be designed or modified so as to preserve and enhance natural and beneficial values of wetlands and must minimize, through mitigation, their destruction, loss, or degradation.

4. Through the natural resource management plan process, parks are required to restore wetland functions and values where they have been harmed by previous human actions.

5. NPS resource management plans and/or water resource management plans must specify requirements for monitoring programs and other actions to ensure protection, enhancement, or successful restoration of wetland values to the greatest extent feasible.

At this writing (2/91), NPS wetlands guidance does not fully address a no-net-loss strategy in that there is no direct link between impacts associated with a project and requirements to compensate for those impacts via wetlands restoration, creation, or other methods. Such strategies are currently being developed at the Departmental level, and will be incorporated into revised NPS wetlands guidelines in the future. Meanwhile, parks should make every effort to incorporate direct compensation for wetland impacts into plans. Such compensation should place a priority on restoration of degraded wetland areas on NPS lands which served equivalent functions in the same wetland system or watershed. This effort should also emphasize greater than acre-for-acre compensation to assure that wetland functions are fully preserved and to contribute to overall net gain of wetlands within the National Park System. The NPS Water Resources Division and the FWS are available for consultation regarding implementation of these objectives.

NPS managers must fully comply with all other applicable wetland laws and regulations:

Compliance with Section 404 of the Clean Water Act is mandatory for all actions with the potential to discharge dredged or fill materials into waters of the United States, including wetlands. NPS managers should contact the appropriate U.S. Army Corps of Engineers (COE) District Office early in the project planning process regarding necessary permits for such actions. As part of the permit process, the COE may require direct compensation for unavoidable wetland impacts. In such cases, NPS managers should strive to further the no-net-loss of wetlands goal by working with the COE in identifying potential wetlands restoration projects.

Compliance with the National Environmental Policy Act (NEPA) as outlined in NPS-12 is modified by the Floodplain and Wetland guidelines. In particular, the public review process is expanded (45 FR 35916 Sec. 6(D)(2)) and an Executive Order 11990 "Statement of Findings," including justification for any impacts upon wetlands, mitigation measures to be implemented, and other pertinent documentation, is required (45 FR 35916 sec. 6(D)(3)).

FWS recommendations under the Fish and Wildlife Coordination Act (generally made as part of the 404 permit/NEPA coordination process) must be considered and implemented to the maximum extent practicable. The FWS has the authority to require mitigation measures as appropriate under the Endangered Species Act.

Parks must comply with state laws and regulations in wetland and other water resources matters where states have jurisdiction. For example, parks are required to fully comply with state water quality standards. Parks are also required by the Coastal Zone Management Act (16 USC 1451 et seq.) to assure that proposed actions are consistent with state coastal zone management plans "to the maximum extent feasible." Even in matters where state and local governments do not have jurisdiction, superintendents should endeavor to assure consistency with state and local laws and regulations related to wetlands protection.

4. Managing Wetland Impacts from External Sources

Virtually all upstream actions that affect park water resources, including wetlands, must go through some form of zoning, permitting, or similar process. NPS managers should investigate and, where possible, actively participate in area planning processes affecting water resources management, development, agriculture, and land management. This is accomplished by coordinating with other federal agencies such as the EPA, the COE, the Bureau of Land Management, the U.S. Forest Service, state and local environmental regulatory and planning agencies, water boards, and so on. It is particularly important to be informed about and involved in the NEPA process for federally funded projects, National Pollution Discharge Elimination System (NPDES) permitting, Clean Water Act Section 404 permitting, and Section 319 nonpoint source pollution control plans.

The EPA conducts an "advanced identification" program in which it identifies critical wetland areas where 404 permits are unlikely to be granted. NPS superintendents should contact the applicable EPA regional office to inquire about and, as appropriate, offer assistance in identifying wetlands outside park borders which, if adversely impacted, may affect park resources.

Consistent with the Clean Water Act, superintendents should assure that the highest possible water quality standards are in place to protect waters entering parks. If possible, Outstanding National Resource Waters (ONRW) or equivalent designation should be attained for high quality park waters, and appropriate nondegradation standards will be established. In most cases these water

quality standards and "use designations" are developed and implemented by the state or by interstate commissions.

Where water quantity/water rights is an issue (volume, timing, spatial distribution of inflows, or impacts due to withdrawals or drainage), superintendents should use the appropriate planning, regulatory, and legal means to preserve or attain hydrologic conditions necessary to meet NPS management mandates for preservation and protection of wetland ecosystems.

Superintendents should assure that properly designed water resources monitoring stations (quantity and quality) are in place at sites where waters potentially impacted by external sources cross park boundaries into wetland areas.

5. Wetland Inventory Procedures

Superintendents should normally use the FWS wetland definition and classification system (Cowardin et al., 1979) as the basis for wetland inventories. This widely accepted system was developed for the purpose of mapping wetlands for the FWS National Wetlands Inventory (NWI). For the NWI, the FWS classifies and maps wetlands on 7.5-minute U.S. Geological Survey topographic maps (15-minute for Alaska). Resolution varies from region to region, with some maps identifying wetlands as small as 0.1 acre. The state FWS field office or the FWS regional wetland coordinator should be contacted to determine if NWI maps have been completed for the area of concern. Where NWI maps are available, they will serve as the "base wetland inventory" for parks. If it is determined that the accuracy or resolution of the NWI is not adequate for management purposes, then more detailed wetland inventory studies should be conducted to supplement the base inventory information.

Because of limitations in border resolution, minimum detectable wetland size, and so on, the NWI wetland mapping will be considered approximate. Thus, while use of the base inventory is sufficient for avoiding wetland impacts in initial project planning, a more detailed on-site evaluation will be conducted for each project to locate any unmapped wetlands, to determine wetland borders more accurately, and to otherwise assure that projects will not impact wetlands adversely. Guidance for conducting the required field evaluations is found below in On-site Wetland Evaluations at Proposed Development Sites.

As part of the wetland inventory process, any known degradation of NPS-managed wetlands and the likely causes of this degradation (e.g., drainage, filling, mining, nutrient enrichment) should be recorded and used in developing restoration plans.

Some states have had the NWI maps digitized. Parks wishing to use the digitized data for geographic information systems or other computer applications should contact the appropriate FWS regional wetland coordinator for information about availability of the data and potential applications.

If the park has not yet been mapped for the NWI, the FWS regional wetland coordinator should be contacted to obtain an estimated date of completion. Several options are available if this date is not sufficiently close to meet NPS wetland compliance requirements. First, some interim sources of wetland inventory information are listed below (in cases where the NWI maps are available, these sources may supplement the existing inventory):

- Departments of Natural Resources (or equivalent agencies) in some states have developed such inventories to support their wetland regulations or other natural resources programs.

- Higher resolution wetland identification and mapping programs may exist in local areas where threats to wetlands and other critical aquatic areas are particularly acute. County and city regulatory and zoning offices should be contacted regarding existence of higher resolution wetland surveys.

- Considerable interim wetland information can be obtained if U.S. Soil Conservation Service (SCS) soil surveys are available for the park. Once the soil "map units" comprising the area are determined from the soils maps, a list of "hydric soil map units" (available from the SCS county agent) can be used to make an initial determination of where wetland soils occur. It must be noted, however, that such classification is general. That is, there may be sufficient nonwetland soil "inclusions" within a hydric soil mapping unit to allow a project to proceed without wetland impacts. Conversely, there may be hydric soil inclusions within map units that do not appear on the hydric soils map unit lists. Therefore, a field check is necessary to determine actual conditions at the proposed site (see following section). SCS personnel are trained to identify wetlands and will conduct a field check on request as time permits.

A second option for situations when the NWI maps are unavailable is to explore a joint effort with the FWS to expedite completion of the NWI. Parks should contact the Water Resources Division regarding an interagency agreement between the NPS and the FWS to facilitate wetland classification and mapping, which is often on a fifty-fifty cost sharing basis. Through such relationships, a park may be able to increase accuracy by assisting in ground-truthing, map verification, or other phases of the inventory process. Other advantages include high project priority and savings associated with equipment and trained personnel offered by the FWS. (The NPS would normally be responsible for 100% of costs for digitizing these maps or for reclassifying and mapping most areas already completed in the NWI.)

A third option is to have appropriately trained staff (or consultants) familiar with the resource conduct aerial photo- or satellite imagery-based wetland inventories. This option has the potential for yielding very high resolution, accurate inventory results geared specifically to the resource management needs of the park. However, it is the most labor intensive and costly of these options, and thus may not be practical for conducting most park-wide wetland inventories. This option may,

however, be appropriate at sites where the probability of wetland impacts from a proposed project is high, where restoration plans for degraded wetland systems are being developed, or where the need for a very high resolution park-wide wetland inventory justifies the cost.

6. On-site Wetland Evaluations at Proposed Development Sites

The park's wetland inventory should be used in the initial stages of project planning to avoid wetland impacts. However, on-site wetland analysis at proposed development sites should always be conducted to verify that wetland impacts will, in fact, be avoided or to develop appropriate mitigation measures if the project has no practicable alternatives. First, a preliminary wetland analysis is performed, followed (where necessary) by definitive wetland delineation.

a. Preliminary On-site Wetland Analysis

Preliminary analyses should be conducted by park resource management specialists, other NPS professionals, or consultants trained in plant identification, ecology, hydrology, environmental science, or closely related fields. The NPS Water Resources Division can provide guidance for conducting the analysis.

The preliminary analysis begins with three initial steps:

Step 1. Any wetlands or other waters near or at the site that were identified in the wetland inventory should be located in the field. The preliminary evaluation for these areas should focus on assuring that the actual wetland borders do not extend onto the proposed site and that no wetlands will otherwise be impacted by the project.

Step 2. The site should be evaluated for areas where wetlands which may have been missed in the NWI or other inventories are most likely to occur (e.g., small isolated depressions, poorly defined drainages in headwaters areas such as mountain meadows, or areas not readily visible from aerial photography). In many cases, the existence of such wetlands will be immediately clear based upon knowledge of local wetland types or obvious presence of wetland characteristics. (Such areas lying adjacent to or downstream from the proposed site should also be noted, and potential impacts should be considered.)

Step 3. An assessment of disturbance at the site should be made, such as drainage, filling, farming, or other factors which may have altered the soil, hydrology, or vegetative features at the site. Awareness of such disturbance not only will help avoid erroneous interpretation of wetland field characteristics, but will also help identify impacted areas that should be considered for restoration under the directives of the NPS Floodplain and Wetland Guidelines.

The preliminary wetland analysis continues with a search for "indicators" of the soil, vegetation, and hydrologic characteristics outlined in the FWS wetland definition. Part III of "The Federal Manual

for Identifying and Delineating Jurisdictional Wetlands" (Federal Interagency Committee for Wetland Delineation, 1989), hereafter referred to as the "Federal Manual," provides a thorough discussion of field indicators for each of the three characteristics. Evidence of any one of these indicators is reason to avoid the site for the proposed action and to seek alternative sites where wetlands would not be adversely impacted.

In the rare situation where no practicable alternatives exist for a project and the preliminary evaluation has indicated the possibility of wetland impacts, the COE must be contacted to assure compliance with Section 404 of the Clean Water Act. Even if the COE determines that a Section 404 permit is not required, full compliance with other directives of the NPS Floodplain and Wetland Guidelines may still be necessary. In either case, definitive wetland delineation must be performed at the site as discussed in the following section.

b. Definitive Wetland Delineation

(1) "Jurisdictional" wetlands

The COE uses the Federal Manual to determine if a site is a "jurisdictional wetland" (one which meets the regulatory definition of a wetland under COE guidelines for implementing Section 404 of the Clean Water Act). Under the regulatory definition, wetlands are:

> ... those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Only about 85% of the habitats classified as wetlands under the FWS definition and classification system are also "jurisdictional wetlands." This is because the FWS definition is more comprehensive, requiring that only one of the three diagnostic soil, hydrology, and vegetation characteristics be present while the regulatory definition requires confirmation of all three characteristics.

The COE district office will determine the need for sending staff to delineate jurisdictional wetland borders at the site of the proposed project, and can provide other siting advice that may help eliminate wetland impacts. However, backlogs at COE district offices for field evaluations may cause unacceptable delays in NPS project planning and implementation. In such cases, park staff (or a qualified contractor) may wish to apply the methods outlined in the Federal Manual and have the results approved by the COE. In such cases, it is essential that the park consult with the COE before carrying out the evaluation to assure both parties that the user understands and is qualified to apply the method.

(2) Actions not subject to Section 404 of the Clean Water Act

Even when the preliminary analysis indicates the possibility of wetland impacts at a site, the COE may determine that a 404 permit is not required. This may occur either because the wetland does not meet the regulatory definition or because the action is exempt from 404 regulation. In such cases, the broader wetland protection requirements of E.O. 11990 and the NPS Floodplain and Wetland Guidelines still apply. Delineation methods outlined in the Federal Manual are still applicable, if modified such that verification of any one of the three diagnostic wetland characteristics (soil, vegetation, hydrology) identifies the site as a wetland. This assures that "non-jurisdictional wetlands" will still be protected as required under the NPS Floodplain and Wetland Guidelines compliance process.

Definitive delineation for nonjurisdictional wetlands will be conducted by park resource management specialists, other NPS professionals, FWS staff, or consultants trained in applying the Federal Manual method. Advice or assistance in delineation for E.O. 11990 compliance can be obtained from the NPS Water Resources Division.

7. Final Siting

In the final siting process, the park should assure that sufficient buffer areas adjacent to wetlands are preserved to protect against direct or indirect adverse impacts. Considerations in determining adequate buffer zones include such matters as introduction of pollutants via runoff, groundwater drainage effects, and maintenance of wildlife corridors.

H. Restoration and Mitigation

Recognizing that part of the directive to the NPS under the Organic Act of 1916 is to provide for public enjoyment, development impacts from internal activities sometimes are inevitable. Many facilities to serve visitors were constructed decades ago when managers were less aware as to how the activity would impact park habitats. Cessation of other activities, such as stocking of non-native fish species, reflects the changing attitudes of society and better ecological understanding by the NPS.

The intent of NPS policy is clear regarding habitat impacts from changes in water quantity, water quality, introduction of non-native species, development, and human-related activities (see NPS Management Policies.) These activities should not result in changes to aquatic habitats or their inhabitants in natural zones. The NPS management policies that direct superintendents to "plan to phase out, relocate, or provide alternative facilities for park developments located in hazardous areas that cannot be reasonably protected", are particularly pertinent to shoreline and floodplain development.

IV. Environmental Review and Compliance

Documents reviewed or prepared for compliance with the National Environmental Policy Act (NEPA) in accordance with guidance provided by NPS-12, the Environmental Compliance guideline, should include an appropriate assessment of aquatic resources issues. Such assessments should identify and evaluate water quality, water quantity, aquatic biological resources, and aquatic habitat (including floodplains and wetlands) implications of the preferred and alternative proposals. Further guidance is found in NPS-12.

When aquatic resources may potentially be impacted, planning activities undertaken in accordance with NPS-2, the Planning Process guideline, should consider the water quality, water quantity, aquatic biological resources, and aquatic habitat (including floodplains and wetlands) implications of the proposed project or activity. Such planning activities include general management plans, development concept plans, natural resource management plans, and resultant action plans including, but not limited to, water resource management plans, fisheries management plans, air quality management plans, and fire management plans.

ROLES AND RESPONSIBILITIES

Aquatic resources management in the NPS is a responsibility shared among staffs of the parks, regional offices, and the Washington Office Natural Resources Directorate.

I. Park

The **superintendent** is responsible for water resources management within the park. The superintendent:

- identifies internal and external activities that may affect the park's aquatic resources or water rights,
- includes aquatic resources information and assessments in all appropriate resources management and planning activities,
- develops management alternatives and a preferred course of action in response to water resource issues,
- implements required or necessary inventory and monitoring activities, and water resources projects (as funded) which are identified in the park's natural resource management plan,
- coordinates park operational plans and activities with water quality management planning and implementation efforts of state and area-wide water quality management

agencies to assure that park facilities, operations, and activities are in compliance with applicable federal and state water pollution and water resources planning requirements,

- complies with all state laws and procedures regarding state created water rights for the use of water on NPS lands, and

- cooperates with federal and state agencies in area-wide water management activities that may affect a park's water resources.

II. Region

The **Regional Director**, through the **regional water resource coordinator:**

- maintains current information pertaining to the status of water resources, water rights, and water resource issues affecting parks within the region,

- manages the regional water resources program, including coordinating water resource funding requests, technical assistance requests, and project prioritization for water resources projects which require Washington Office or regional support,

- participates in and, if necessary, coordinates the development of water resource management plans and the water resource component of natural resource management plans, and

- coordinates with the regional environmental compliance officer to assure that water resources have been adequately addressed in required environmental compliance activities and document review.

III. Washington Office

The **Associate Director, Natural Resources**, through the Water Resources Division, is responsible for program development and Servicewide initiatives involving aquatic resource policy, planning, resource management, and research. In addition, the Associate Director, Natural Resources provides and oversees Servicewide natural resource funding that has been allocated to address aquatic resource issues.

The **Water Resources Division**, acting under the direction of the Associate Director, Natural Resources:

- formulates water resource policy recommendations,

- provides planning assistance and regulatory review,

- provides technical support in the identification, evaluation, and mitigation of existing and potential threats to park water quantity and water quality,
- secures and protects NPS water rights and water resources,
- maintains an updated water rights docket system for the National Park System,
- assists in floodplain and flood hazard analysis and delineation,
- provides guidance in the protection of aquatic and riparian habitats and in erosion and sediment control,
- locates and tests surface and groundwater sources for potable water needs,
- develops hydrologic methods and conducts watershed monitoring and research, and
- develops and implements hydrologic and related physical and biological projects and studies in support of water resource needs,
- provides guidance and training in water resource management to regional and park personnel.

The **Wildlife and Vegetation Division**, acting under the direction of the Associate Director, Natural Resources:

- formulates Servicewide policy and plans, coordinates, evaluates, and implements wildlife, vegetation, and natural resources programs of broad Servicewide importance, including programs relating to aquatic wildlife and vegetation resources,
- provides expert scientific, planning, implementation, and evaluation assistance and technical support to management actions at the park, regional or Servicewide levels on projects relating to aquatic wildlife, vegetation, and related natural resources management, and
- formulates policy and develops programs relating to NPS fisheries management and effects on native aquatic biota, and effects of exotics and pest management treatments on native aquatic biota.

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MARINE RESOURCES MANAGEMENT

Marine resources represent a significant component of the NPS resources management responsibility. Over 25 parks manage some marine resources. These resources are significant to global ecology and economy as a source of atmospheric water and oxygen, food, minerals, transportation, and recreation. Yet, comparatively little is known about marine biota and ecology, physical and chemical processes, and topography. Coastlines are under increasing development pressure, but systems for baseline monitoring and evaluation of cumulative impacts on marine resources are still relatively undeveloped. This section discusses management of the portion of these resources under the NPS care.

DEFINITIONS

Benthic Of, relating to, or occurring in the depths of the ocean, or the bottom underlying these depths.

Coral reef A reef consisting primarily of hard corals scattered over a hard bottom. True coral reefs are formed when several species of coral and red algae secrete layers of limestone to create a consolidated framework.

Intertidal zone The shoreline lying between the lowest low and highest high tides. The area of the intertidal zone can vary greatly in size, slope, and time exposed depending on the local conditions.

Kelp forest An area of hard bottom substrate dominated by large brown algae known as kelp. On the Pacific coast the giant kelp, Macrocystis, is often the dominant species and is the best known. On the Atlantic coast, species of Laminaria are the most important in some areas.

Pelagic Of, relating to, or living in the open sea, especially those portions beyond the outer border of the littoral zone (along the shore) which are above the abyssal (deep) zone and to which light penetrates.

Sea grass Any of several species of salt or brackish water plants that flower and produce seed underwater. They create dense mats or "meadows" that bind the substratum and prevent it from being washed away or shifted about by the currents. There are five dominant species: Cuban shoal grass (Halodule wrightii), manatee grass (Syringodium filiforme), turtle grass (Thalassia testudinum), eelgrass (Zostera), and widgeongrass (Ruppia maritima).

POLICY AND PROGRAM OBJECTIVES

The NPS Management Policies calls for management of natural systems based on park management zones. While there is no mention of a specific marine resources management policy, surface freshwater, groundwater, floodplains, wetlands, shoreline processes, and biological resources are all

discussed. Policy guidance for marine resources is derived from the general discussion of natural resource management:

> The National Park Service will manage the natural resources of the national park system to maintain, rehabilitate, and perpetuate their inherent integrity. (4:1)

Objectives for marine resources management are the following.

1. Inventory all ecosystem components.
2. Maintain and restore all components and processes of naturally evolving park marine ecosystems, recognizing that change caused by extreme natural events (e.g., storms, red tide, el Nino) is an integral part of functioning natural systems.
3. Maintain natural genetic diversity of marine ecosystems.
4. Maintain or improve water quality affecting marine ecosystems.
5. Maintain or improve air quality affecting marine ecosystems.
6. Maintain natural marine viewsheds.
7. Protect and restore threatened and endangered species and their critical habitat.
8. Regulate and mitigate human activities to minimize adverse impacts.
9. Determine limits of natural system variation (baseline conditions).
10. Monitor system dynamics to detect abnormal changes in time to affect remedial actions.
11. Educate visitors about the importance and fragility of marine resources, threats to them, and mitigation to lessen impact.

AUTHORITIES

See the discussion of general authorities in Chapter 1. Other statutory laws that apply more specifically to marine resources management include: the Marine Mammal Protection Act; the Marine Protection, Research and Sanctuaries Act; the Migratory Marine Game-Fish Act; the Outer Continental Shelf Lands Act; and the Coastal Zone Management Act. The International Convention for the Prevention of Pollution from Ships (MARPOL 73/78 (Annex V) 1987, PL 100-220) is a treaty related to marine resources management.

Other pertinent laws and executive orders include the Clean Air Act; the Federal Water Pollution Control Act (Clean Water Act); the Endangered Species Act; the Fish and Wildlife Coordination Act; the Wilderness Act; the Archaeological and Historic Preservation Act; the Rivers and Harbors Appropriation Act; the Resource Conservation and Recovery Act (RCRA); the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund); Executive Order 11514, Protection and Enhancement of Environmental Quality, as amended; and Executive Order 12088, Federal Compliance with Pollution Control Standards.

RELATIONSHIP TO OTHER GUIDANCE

Existing guidelines that contain material pertinent to the management of marine resources include NPS-2, the Planning Process guideline (management zoning); NPS-12, the Environmental Compliance guideline (impact assessment and mitigation); NPS-28, the Cultural Resources Management guideline; NPS-48, the Concession Management guideline; NPS-53, the Special Park Uses guideline (permitting for scientific activities); and NPS-75, the (draft) Inventory and Monitoring guideline.

In this Guideline, see Chapter 2, Native Animal Management, Freshwater Resources Management, Geologic Resources Management, Paleontological Resources Management, Air Resources Management, Protection of Aesthetic Values, Endangered, Threatened and Rare Species Management, and Hazardous Waste Management; Chapter 3, Fishing, Minerals Management, Rights-of-Way and Easements; Chapter 4, Resource Management Plan, Special Park Designations, and Environmental Compliance.

PROGRAM GUIDANCE

I. Management Issues

Several factors which adversely affect marine resources are beyond human control. Storm swells and waves overturn and fracture coral colonies and tear loose kelp. Heavy rainfall carries soil from the land into adjacent waters, resulting in high levels of suspended particles which reduce sunlight reaching photosynthetic organisms and may add toxins to the water column. Exceptionally low or high water temperatures can kill organisms. Disease, such as "white band" and "black band" on coral, kill entire portions of an ecosystem.

Damage from human activities can often overlay or add to destruction from natural causes. This discussion will focus on the identification of issues and threats which can be eliminated, modified, minimized, or mitigated. Endemic species are not as frequent in the ocean as on land. Consequently, management of marine resources primarily focuses on management of the entire ecosystem and not single species.

A. Water Pollution

Various forms of water pollution affect individual organisms. Oil, dissolved toxins and heavy metals, and suspended particulates are widespread problems affecting even the most remote areas. Non-lethal levels of toxins can build up in tissues of organisms, affecting fecundity and disease resistance and reducing value to recreational and commercial uses. Fuel discharged from bilges and release of human wastes from boats add to the "unnatural" elements that organisms have to adapt to. Municipal sewage and storm drain outfalls pose a variety of threats, including increased silt loads, nutrient enrichment, and freshwater influx. The park should inventory to determine baseline conditions and then monitor to identify sources and trends of any water pollution problems.

B. Fisheries

The NPS Management Policies states that:

> Commercial fishing will be allowed only where specifically authorized by federal law or treaty right. (8:4)

In some marine fisheries, limits require the release of smaller sized fish while allowing the retention of larger breeders. Over a period of time, this practice may adversely affect the genetic diversity and/or integrity of fish stocks. Superintendents must not allow harvest to reduce the reproductive potential of the population or to radically alter its natural (unfished) age structure. Areas may be zoned to protect nurseries or breeders from overfishing by recreational or commercial fishing. See further, Chapter 3, Fishing.

Stocking a water body is adding a supply of raised fish. The rearing of commercial marine species for direct harvest is mariculture and of any water-dependent species, aquaculture. The stocking of fish into nonpark marine waters is predominantly conducted by state game and fish departments for increasing finfish numbers. This technique tends to treat the symptom (reduced numbers) and not the cause of the problem, such as overfishing or loss of habitat. Potential effects of aquaculture on inshore coastal waters include pollution from affluents, physical alteration of the environment, and the introduction of exotic organisms.

In many coastal areas, materials such as tires, cement blocks, railroad cars, and old oil drilling platforms are being placed offshore as fish attractors and to create destination fishing sites for depressed local economies. These materials alter bottom currents and increase abundance at lower levels of the food chain. Artificial obstructions such as these tend to concentrate pelagic and larger-sized bottom fish, making them easier to harvest. They also disrupt natural recruitment of finfish. Superintendents should be aware that areas in or near the NPS units are often seen as candidates for these types of manipulative activities because of generally good water quality, easy access from shoreline, and protection of facilities from poachers. Parks need to take appropriate actions to identify, prevent, or mitigate developments of this kind that would affect park resources. (See further, Chapter 3, Fishing.)

C. Disturbance

Many marine organisms and even ecosystems are well adapted to harsh physical extremes, but are very sensitive to unnatural perturbations and are slow to recover. Coastal parks are facing increasing visitor usage, primarily in the form of increased boating and fishing. Disturbance in the NPS coastal units can be caused by construction, dredging, human presence, trampling, or handling. Construction of jetties and marinas and shoreline stabilization has wide-ranging effects on both the physical and biotic components of the community. Careless upper watershed development accelerates runoff of sediments into the water. Dredging to deepen navigation channels or to obtain sand can lead to removal of organisms and deterioration of downstream areas due to accumulation of sediment particles, which smother corals, seagrass, and other sensitive communities or severely decrease light needed for photosynthesis. Filling areas with dredge spoil or upland sediment to create more "usable" shoreline is also habitat disruption. All of these activities can affect substrate type, currents, and wave patterns, which changes community structure.

Marine resource areas may be zoned to designate where various strategies for management and use will best fulfill management objectives and maximize resource protection. Such zonation will prescribe appropriate visitor uses within the zone. Considerations for the development of use zones may include the significance or sensitivity of the resources within the zone, the ability of those resources to support a particular visitor use, the compatibility of competing visitor uses within a zone, and the purpose of the park. Designations of such zones should be tied to the park's published 36 CFR regulations, the general management plan, the statement for management, the resource management plan, and other appropriate standard planning and enforcement documents.

Boats anchoring, striking, or running aground cause considerable damage. Destruction from anchors and anchor chains is an especially severe problem in some NPS coral reef units, as the fastest growing corals grow only a few centimeters a year. As an anchored boat moves in the wind and currents, its anchor chain can scour out a large area of the bottom, ripping up corals, sponges, algae, and other organisms. Fish traps are sometimes dumped directly on corals.

Zoning of anchor site locations can considerably minimize damage from anchoring. Anchor sites should be identified. In some areas, setting a minimum depth or distance from shore may be effective. In other areas, sandy locations should be identified as anchor sites rather than coral communities or seagrass beds. Installation of mooring buoys in popular areas can dramatically minimize anchor damage. It may be preferable to have installation and maintenance of buoys under a concessions operation. Dissemination of information on appropriate anchoring sites and methods is important. Superintendents should consider exclusion of all boats or boats above a certain size from particularly vulnerable areas.

Human presence may disrupt seabird and pinniped rookeries. The simple act of approaching too close to breeding seabirds or pinnipeds may cause abandonment of the young. Even temporary abandonment can cause severe thermal stress or allow exposure to predators. Disturbance of nonbreeding seabirds and pinnipeds can cause stress to resting animals or injury during a pinniped

stampede. Prolonged human presence may cause abandonment of a site, effectively reducing the habitat of that animal. These areas should be identified and appropriately zoned and managed to minimize disruption and damage.

Recreation enthusiasts and education groups inadvertently cause damage through trampling, rock turning, and collecting. Different organisms and community types react differently in terms of tolerance and recovery. In general, sandy beaches tolerate trampling better than rocky shores. Hard-shelled organisms can withstand trampling better than soft-bodied organisms, but their recovery may take longer. Rocks left turned over lead to the death of organisms that were underneath.

Snorkelers inadvertently fracture coral branches by standing on them or colliding with them. Standing or sitting on corals kills coral tissues. Visitors sometimes collect hard corals, sea fans, or other reef organisms as souvenirs, while divers occasionally take endangered black corals from deeper waters. Effective interpretation and enforcement programs can help reduce these problems.

D. Marine Debris

Persistent marine debris is a threat everywhere, causing both direct and indirect impacts. Marine organisms die or are mutilated through entanglement, ingestion, smothering, and crushing. Marine debris affects the aesthetics and recreational quality of marine and coastal areas. Persistent marine debris consists predominantly of plastics entering the water from cruise ships, commercial and recreational fishing vessels, pleasure boats, offshore oil and gas platforms and vessels, and transport freighters. Sea turtles, sea birds, and fish ingest plastic bags and styrofoam particles and die. Plastic bags wrap around corals and smother the tissues underneath. Nylon rope and monofilament line wrap around marine animals, amputating limbs. Efforts are underway to alleviate the extent of the problem: to create plastics that degrade in sunlight, to compact and incinerate trash at ports, and to create "no-disposal" areas along the coastline and in the Gulf of Mexico. The NPS is also cooperating with the National Marine Fisheries Service to monitor trends in persistent marine debris nationwide. Individual parks have the responsibility to conduct regular monitoring and to carry out needed mitigation activities.

E. Offshore Mineral Development

The Minerals Management Service (MMS) in the Department of the Interior is the federal agency in charge of leasing offshore minerals (oil, gas, sulphur) and monitoring their exploration and development. Federal waters include all subsurface minerals from 12 to 200 miles offshore. A variety of state agencies manage mineral development close to shore on or below state-owned bottoms.

Both state and federally managed offshore mineral development can have devastating impacts on coastal resources from oil spills, marine debris, pipeline crossings, onshore development of support and processing facilities, degradation of air and water quality, and aesthetic intrusion in the park's

viewshed. There are also impacts from lack of turbidity control during drilling, changes in bottom topography, ocean disposal of tailings and spoils and, of recent concern, contaminated waters.

To be effective in protecting park resources, the superintendent should understand the offshore mineral development permitting process. The park should be involved on regional technical working groups in order to represent the park's resource protection mandate during planning. Sensitive areas may be identified as nonconsumptive areas for mineral extraction activities. The NPS should work with MMS, other advisory agencies, and the oil industry to have coastal parks recognized as special zones to be preserved and protected. The NPS should encourage spill contingency planning on a regional and local level. Through this forum, research and studies can also be proposed and selected that assist in park management decisions. See further, Chapter 2, Hazardous Waste Management and Chapter 3, Minerals Management.

F. Adjacent Land Use

The NPS Management Policies states that:

> natural shoreline processes...will be allowed to continue....except where control measures are required by law. (4:20)

Adjacent land use practices can have a significant effect on coastal resources and processes of park units. The entire sediment budget controlling erosion, deposition, and shoreline migration is held offshore in sand bars and onshore in dunes. The sediment source is from rivers and terrestrial erosion. Rivers may be dammed and land made bare outside of parks, thereby affecting park resources. Groins, jetties, rip-rap, and other shoreline armoring or hardening structures modify natural shoreline sediment transport processes.

Dredging increases sediment loading and potentially introduces toxins into the water column. Dredging and filling both modify and destroy habitat such as coastal wetlands and seagrass beds. On the other hand, dredge spoil composed of coarse sandy material can be used to nourish eroding shorelines and to create small islands utilized by colonial waterbirds for nesting, thereby mitigating the loss of beaches to development.

Before implementation of dredging or major construction activities in or outside of the park that could affect coastal resources in the park, the potential impact to the complex coastal processes should be carefully identified, and the least damaging approach should be implemented. The site should then be monitored to assess and document the impact on the resource.

Runoff from agricultural areas may contain herbicides and fertilizer that alter marine ecosystems. Urban runoff and sewer outfalls contain hydrocarbons, nutrients, debris, and other substances harmful to marine life. Urban development concentrates and increases human impacts on adjacent park resources.

G. Exotic Species

Park managers should be alert to the potential introduction of exotic marine species into park waters in ship ballast, on ship hulls, by storm activity, from mariculture/aquaculture activities, and through attachment to marine debris.

H. Scientific Specimen Collection

Collecting marine specimens for scientific purposes must be authorized by the park superintendent in accordance with requirements for 36 CFR 2.50. The mechanism for scientific sample collections is the Specimen Collection permit, covered in 36 CFR 2.5 and NPS-53, the Special Park Uses guideline. See also, Chapter 5, Collections, in this Guideline.

II. Monitoring

Management actions should include baseline inventories to know what the community structure is. These usually utilize both random and permanent quadrats and transects to identify and enumerate all species present. Since seasonal and tidal changes may be present, one visit is not sufficient. Baseline inventories and specific research will determine zones or taxa to be monitored. Since manpower and funding usually restrict study design, indicator species can be selected to provide a picture of the community health. Long-term monitoring is important to identify both spatial and temporal patterns and to identify the range of natural dynamics. Park managers need information about population dynamics to make decisions about potential impacts. Once long-term monitoring is underway, research identifies causes of perturbations and suggests ways to mitigate impacts.

A. Geophysical Processes

Highly dynamic geological features on barrier islands and other shorelines, such as beach profiles, sediment budgets, and offshore bathymetry (the measure of the depth of water in oceans, seas, and lakes), should be monitored. The rapid changes these features exhibit after storms, or even during daily tidal fluctuations, makes it imperative to establish a multidisciplinary monitoring program that measures both landform loss and changes while observing the effects of such change on the habitats they comprise. The most critical information needs are the current state or condition of the beach system and rates of change. Data of this type can be obtained by ground surveys, maps, charts, and aerial photographs (Dolan et al., 1980). Understanding the interrelationships of geophysical processes and the effects of these processes on habitats and the species that inhabit them is crucial to the proper management of shoreline resources. A sample monitoring program is outlined in Exhibit 1.

B. Marine Water Quality Management

The Environmental Protection Agency (EPA) and various state agencies have determined water quality standards for a variety of parameters in order to protect human health and aquatic life.

Before establishing a marine water quality monitoring program, a sampling objective(s) with management implications needs to be established.

1. Determine the need for and uses of water quality data. What changes, plans, or decisions can be made using the data?

2. Identify the potential sources of water quality degradation. Evaluate adjacent land use practices for potential impacts. Identify the potential impacts and possible severity.

3. Conduct a literature survey and correspond with other agencies and researchers to obtain and/or evaluate baseline data characterizing historical and existing marine water quality. This can be added to the park's data or may be the only data the park can base decisions on.

4. Determine where samples need to be taken. Where possible, link sample sites to locations used by previous monitoring or used by other agencies.

5. Select water quality parameters and sampling frequencies. Select methods used to sample and analyze parameters selected. Select statistical analysis procedures and method of handling data. Establish a quality control program for calibration of sampling equipment to known standards to meet EPA certification.

6. Evaluate and calculate costs and manpower needs for the most effective implementation (in-house, cooperative or interagency agreement, contractor, CPSU). See also, Chapter 2, Freshwater Resources Management for further guidance and listing of references.

C. Intertidal Zone

The most common intertidal monitoring methods use permanent quadrats and/or transects. Baseline inventories will determine zones or taxa to be monitored. Since intertidal communities are often very diverse and spatially "patchy" in distribution, dominant and indicator species may be monitored to provide a picture of the community health. Routine sampling, sorting, and classifying of invertebrates will be required to understand seasonality. Specific management problems will determine whether photoquadrats for dominant species or complete species enumeration should be used. Size frequencies provide useful information on population dynamics.

D. Kelp Forests

Kelp forests require a variety of monitoring methods because of the diversity of taxa living there. Specific research projects will be required to design a monitoring program for a specific area.

E. Coral Reefs

A suggested outline of coral reef monitoring procedures is presented below. More detailed information may be obtained from Virgin Islands National Park.

1. Monitoring Resource Use

   a. Record number of visitors, number and size of boats.

   b. Identify most popular anchorages and snorkeling sites.

   c. Record number of broken branches or prop scars on colonies in shallow, heavily visited reefs; for example, along underwater snorkeling trails.

   d. Monitor anchor damage. In cases of severe damage, use videotape and still photographs for documentation. Estimate area of damage. Use quadrats in areas adjacent to anchor scars to estimate number of coral species and amount of living coral that were destroyed.

2. Monitoring the Coral Reef Environment

Long-term assessment of coral reefs should ideally take place at three levels.

   a. Conduct routine gathering of data on basic environmental parameters such as temperature, salinity, and turbidity (water quality).

   b. Track benthic reef organisms with a combination of photographic and transect/quadrat methods and documentation of fish populations.

   c. Conduct experimental research following detection of change in abundance or spatial arrangement of reef components.

REFERENCES

References that are helpful in describing marine flora, fauna, and habitats include:

Bateman, Graham (ed.). 1984. All The World's Animals: Sea Mammals. Torstar Books, New York.

Britton, Joseph C. and Brian Morton. 1989. Shore Ecology of the Gulf of Mexico. University of Texas Press, Austin.

Dern, R. G. and R. Dolan. 1990. Review of Dredging Effects on Adjacent Park Systems. Draft NPS Report.

Dolan, R., B. P. Hayden, P. May and S. May. 1980. The reliability of shoreline change measurements from aerial photographs. Shore and Beach Vol. 48, No. 4.

Kozloff, Eugene N. 1974. Seashore Life of Puget Sound, the Strait of Georgia, and the San Juan Archipelago. University of Washington Press, Seattle.

Levine, Joseph S. 1985. Undersea Life. Stewart, Tabori & Chang, New York.

Thorson, Gunnar. 1971. Life in the Sea. World University Library, McGraw-Hill Book Company, New York.

MONITORING PLAN EXAMPLE - EXHIBIT 1

This monitoring plan was developed by Dern and Dolan (1990) to measure the effects of dradging on coastal parks. Presented here in standard form, it includes both physical and biological components.

PHYSICAL MONITORING

The physical monitoring program addresses three needs: (1) performance, (2) public information, and (3) park management.

I. Performance Related Monitoring Needs

The primary performance related monitoring need is associated with the performance and evolution of the system, especially the sand flows and beneficial and adverse effects of the placement. Monitoring is particularly valuable to assist in understanding the natural system and to fine-tune later maintenance nourishment projects. Detailed needs are discussed below.

1. Profile Evolution

Repeated profile surveys serve to document the three-dimensional changes in volume. Documented volumetric changes along with an estimate of longshore sediment transport at one location allow determination of the rates of sand flow as a function of alongshore distance. A sufficient number of profiles should be measured to allow definition of anomalous features, such as the rhythmic planform features that can be fairly accentuated at some locations.

2. Shoreline Change

Reliable historical ground level survey information is lacking for many coastal parks. The best sources available to evaluate shoreline change are: maps and National Ocean Survey (U. S. Coast and Geodetic Survey) nautical charts; low distortion/high resolution aerial photography; and remote sensed satellite imagery.

3. Wave Measurements

The wave characteristics relevant to sediment transport include: height (or energy), period, and direction. Results obtained from a directional wave gage provide such data and allow much better interpretation of volumetric changes and profile adjustment. Available wave measurements also facilitate interpretation of storm effects including any documented difference between the effects in nourished and control areas.

4. Wind and Precipitation Measurements

Onshore winds blowing across dry sand tend to transport the fine fraction and deposit it as dunes. In addition to providing a better basis for understanding this process, these measurements along with sediment samples assist in interpreting armoring of the surface by the remaining larger particles, particularly shell fragments.

5. Vegetation Response

In order to document vegetation response to nourishment and, where carried out, the effectiveness of vegetation establishment efforts, the monitoring should include a systematic plan for photographic documentation, yet retain sufficient flexibility to respond to unanticipated vegetation features of interest.

II. Public Interest/Education Monitoring Needs

Because of public recreational use of the beach, any obvious physical changes to the system is likely to elicit substantial public interest in any project, including the NPS rationale and justification for mitigation, basis for need, etc.; actual versus anticipated consequences; and modification of NPS policy as the result of experience obtained. An adequate monitoring program will ensure a basis for responding to this public interest consistent with NPS management policies and responsibilities.

III. Management Monitoring Needs

Consistent with NPS responsibilities to manage park systems in a near-natural state and to understand the consequences of various management alternatives, it is essential to monitor perturbations to these systems in order to better understand the natural system and its capacity to adjust to anthropogenic perturbations. Knowledge gained will assist in providing guidance to future management decisions related to beach nourishment.

BIOLOGICAL MONITORING

The monitoring to establish the biological effects of a beach nourishment project includes two elements; each of these is described briefly below.

I. Benthic Community Studies

Studies should be carried out to establish the effect of beach processes on the benthic community. Sampling should be conducted along transects extending from the berm to at least the 20 foot contour offshore or, in the case of barrier islands, from the 20 foot seaward contour across the island to the bay/lagoon side.

II. Vegetation Analysis

Natural and revegetation success should be documented by a combination of transects supplemented by color infrared aerial photography. The objective is to quantify the revegetation with time as affected by various ground conditions including elevation, compactness, distance from shoreline, etc.

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GEOLOGIC RESOURCES MANAGEMENT

Geologic resources are present in all natural parks. Surficial geologic features are especially important for their scenic grandeur, their provision of a structural foundation for biotic systems, and as a primary interface with most cycling ecosystems. They are important for recreation, as well. This section emphasizes management issues and geologic features of special management concern.

DEFINITIONS

Geology The study of the earth. Geology is concerned with the origin, history, structure, morphology, and composition of the earth, and with the processes that originally formed the earth and continue to shape it. Geology considers the physical and, to a lesser degree, the biological processes at work on the earth, the chemistry of the earth's constituents, and the record of its past.

Geologic processes The forces that formed and shaped the earth originally and that continue to shape the earth. Geologic processes include erosion, sedimentation, lithification (rock formation), folding, faulting, weathering, metamorphism, plate movement, and volcanism. The active agents of these processes are water, air, ice, gravity, molten rock, plants, and animals.

Geologic features The products of the action of the processes or forces acting on the earth. Some common and obvious features are mountains, rivers, oceans, mesas, valleys, dunes, geysers, glaciers and glacial features, volcanoes, fossils, rocks, and minerals. Less obvious to the visitor are such features as ripple marks, raindrop impressions, rock formations, economic mineral deposits, and soil horizons.

POLICY AND PROGRAM OBJECTIVES

I. Policy

The NPS Management Policies states that:

> Park geologic features will be protected. Certain fragile geologic features, such as geysers, caves, sand dunes, and arches, will be monitored to determine if measures are needed to prevent or stop human-caused damage. (4:19-20)

A. Issues and Implementation

Issues include:

1. preservation of geologic resources,

2. monitoring geologic features and processes,

3. addressing conflicts between geologic processes and impacts on cultural resources,

4. scientific and recreational collecting,

5. educational opportunities and interpretation,

6. geologic research,

7. minerals exploration, and

8. mineral assessments.

The fundamental policy to be implemented is the preservation of the geologic resources of parks in their natural condition whenever possible. It may be necessary in some cases to restrict public access to a particularly sensitive or fragile geologic resource or some aspect of the resource. Access may also be controlled when necessary for human safety, as in the case of volcanic eruptions in Hawaii Volcanoes National Park and in areas of glacier movement. Some geologic resources or portions of them may be managed exclusively for research, with access limited to approved research personnel.

Specific management techniques for particular geologic features and processes should be applied on a park-specific and resource-specific basis. Geologic processes are forces of nature that can be observed and monitored. These forces may be influenced or controlled in certain circumstances. For example, rivers can be controlled by control dikes and berms. Natural patterns of coastal change are often modified by human intervention through armoring, sand-trapping devices, and dredging plus beach nourishment. (Those processes causing shoreline migration, where occurring naturally, will be allowed to continue except where control measures are required by law.) NPS managers are frequently faced with the issue of how to manage natural resources, including geologic processes, when they are in conflict with preserving and protecting cultural resources. This issue is specifically addressed with respect to shoreline management in Management Policies 4:20-21.

The two categories of collection of geologic surface samples such as rocks, minerals, and fossils are collecting for personal use and collecting for scientific purposes. NPS policy prohibits such collecting except for several specific circumstances described here and under Program Guidance, below. Recreational collecting of geologic samples, such as rockhounding or gold panning, is prohibited in all units of the National Park System (36 CFR 2.1(a)) except for the Whiskeytown unit of the Whiskeytown-Shasta-Trinity National Recreation Area and certain other units in Alaska. Whiskeytown has special regulations that allow recreational gold panning. In Alaska, collection of rocks and minerals for personal use is acceptable under 36 CFR 13.20(c):

> Surface collection, by hand (including hand-held gold pans) and for personal recreational use only, of rocks and minerals is permitted: Provided, however, That (1) collection of silver, platinum, gemstones and fossils is prohibited, and (2) collection methods which may

result in disturbance of the ground surface, such as the use of shovels, pickaxes, sluice boxes, and dredges, are prohibited.

Regulations at 36 CFR 13.20(a) state that "[t]his section applies to all park areas in Alaska except Klondike Gold Rush National Historical Park, Sitka National Historical Park, the former Mt. McKinley National Park, Glacier Bay National Monument, and Katmai National Monument."

Although no permit is required for personal collecting in the Alaska parks, it is recommended that the parks develop a tracking mechanism to monitor collecting. This may be as simple as having visitors complete a form or questionnaire.

Interpretation of geologic resources is a significant part of the interpretation and education program in many parks and should be considered a part of geologic resources management. However, the geologic interpretation program should not be a consumptive one: That is, except for certain situations described above, rocks, fossils, crystals, and mineral specimens may not be removed from a park. Other public lands are available for collection experiences.

If managers are to foster geologic research beneficial to the unit and the Service, it is important to distinguish research from mineral assessment and exploration. A detailed discussion of this can be found in NPS-66, the Minerals Management guideline, Chapter 7, Section III, Mineral Assessment and Research in National Park System Units. The following is a summary of that discussion.

Geologic research. Research is a scholarly inquiry and investigation into facts, processes, and hypotheses that explain phenomena. Research is intended to broaden the base of human understanding and as such its conclusions will be published. Governmental agencies, universities, and private entities often approach NPS managers with research requests and proposals that may directly or indirectly have value for mineral exploration purposes. Scientific research involving minerals may be allowed under circumstances where mineral exploration would be prohibited.

Research may be conducted by federal or nonfederal parties and funded either publicly or privately. The NPS will consider all research requests that meet scientific research criteria, even if the study may produce information that is incidentally useful to mineral exploration. Managers may permit the activity within the park if, in fact, the research is consistent with the NPS Management Policies.

Exploration. Exploration is the conduct of activities whose objective is to obtain data on the nature and extent of mineral deposits within parks or data that would further the knowledge of mineral deposits outside of parks. These activities can be funded by nonfederal parties. The data gathered is part of, or a prelude to, a commercial venture and is generally proprietary (i.e., unavailable for free public use). NPS managers should

deny requests for exploration on federal lands in the park, except by lessees or permittees of federal minerals.

Mineral assessments by federal agencies. The NPS will not approve or permit exploration, collection, or assessments of federal minerals within National Park System units by other federal agencies except where such assessments are authorized in law. The Director's memorandum of Oct. 9, 1981, states that all federal agency requests for mineral resource surveys in National Park System units open to "regulated mineral entry" (i.e., mineral leasing) must be forwarded to the Washington Office for disposition on a case-by-case basis.

In Alaska, 16 USC 3150(a) authorizes the Secretary of the Interior to conduct mineral resource assessments on any federal lands, including lands in a NPS unit. This program is known as the Alaska Mineral Resource Assessment Program (AMRAP). Approval may be granted by the Regional Director on a case-by-case basis.

Under AMRAP, nonfederal parties may also conduct mineral assessments in NPS units in Alaska, if the nonfederal party is a contractor for a federal agency (16 USC 3150(a)). AMRAP assessments may be conducted only under appropriate regulations (which have not been developed as of this writing).

II. Program Objectives

There are six major program objectives the NPS should seek to achieve in order to protect geologic resources:

1. inventory and identify significant geologic features and processes;
2. protect geologic features;
3. observe and monitor the geologic processes;
4. provide interpretation and education;
5. coordinate and assist with geologic research in NPS units; and
6. integrate geologic resource management into the planning process.

These objectives are discussed in more detail in Program Guidance, below.

AUTHORITIES

General authorities are discussed in Chapter 1. Legislation dealing with specific geologic features includes the Coastal Barrier Resources Act, the Wild and Scenic Rivers Act, and General Provisions (PL 99-591) to list the significant thermal features to be included on the Federal Register. The Wilderness Act makes specific reference to protection of geological features.

RELATIONSHIP TO OTHER GUIDANCE

Specific requirements are set out in 36 CFR and in park-specific planning documents such as general management plans, resource management plans, and land protection plans. In this Guideline, see Chapter 2, Freshwater Resources Management, Cave Management, Soils Management, and Paleontological Resources Management; Chapter 3, Minerals Management; and Chapter 5, Inventory and Monitoring.

PROGRAM GUIDANCE

I. Program Elements

A. Identification and Inventory of Resources

An inventory of the various geologic features, formations, and resources found in the park forms the basis of a sound geologic resources management program. Some of this information may already exist and merely needs to be collected. All available geologic maps should be collected, and a library of all relevant publications on the geologic resources of the unit should be kept current. It is not always advisable to collect all the geologic references; in some instances, the data are too voluminous. It is recommended that a bibliography of geological references be generated for each park with geological resources. This bibliography should include the typical sources, including the U.S. Geological Survey, state geological surveys, geological societies, and academic institutions (Masters and Ph.D. theses).

Knowledge of the geology of an area can assist management in making decisions such as where to locate facilities. It is necessary to avoid areas with geologic hazards such as faults, rockfall areas, landslides, and unstable substrata to protect park structures, roads, and visitors.

An inventory of all significant geothermal features within parks is required by Congress (Section 115, Department of the Interior and Related Agencies Appropriations Act of 1987).

Inventories and maps of paleontologic and mineral collecting sites should be kept current so that activity on those sites can be monitored and those resources can be adequately protected. The location and condition of other fragile features should be noted so they can be protected as well.

Cave mapping should be kept current so the extent of the passages is known. Newly discovered portions of caves may lie outside park boundaries. Knowledge of this will enable management to pursue methods of protecting the cave resource by forming agreements with the appropriate external landowners.

B. Protection of Geologic Resources

Some geologic resources are fragile or may easily deteriorate from human influences and need special protection. Fragile geologic features within parks may be protected from human damage either by educating the public as to their value and frailty or by isolating the feature from human intervention, such as with fencing. Protection is a constant balancing act. Some geologic features may become more fragile and susceptible to damage with age and may need protection. As visitation continues to increase Servicewide, additional features may need protection and those already under protection may require more stringent protection. Servicewide and park-specific protection policies and programs need to be continually reevaluated by management. Protection of geologic resources from natural phenomena may be controversial, but, at times, necessary. For example, if the course of a river threatens to destroy an important fossil bed, the park must decide whether to control the river course in order to protect another geologic resource.

C. Observation and Monitoring of Geologic Resources

Geologic features subject to deterioration, movement, growth, or other types of changes should be monitored. These include fragile cave resources (to monitor growth and/or deterioration due to human impact), movement along faults, movement of slumps or landslides, rates of erosion or change of barrier islands, movement of glaciers, and movement of dunes. After a determination is made as to what geologic features and processes should be subject to observation and monitoring, it should be done on a routine basis. On the most basic level, such observation and monitoring provides baseline data needed to manage the park and to protect the geologic resource.

Monitoring may be done by the park or by outside groups or agencies. At Hawaii Volcanoes, the U.S. Geological Survey observes changing activity via the Hawaiian Volcano Observatory. In some cases, volunteers from the scientific community may be used to monitor on-going phenomena such as the Yellowstone geysers. It is important that whoever does the monitoring have direct scientific involvement in the design (and review) of all monitoring protocols and in the analysis of the data at regular intervals. In addition, the monitoring should meet NPS requirements.

D. Interpretation of Geologic Features and Processes

Each park determines the geologic resources to be interpreted. The development of any interpretive program or the revision of old programs involving geologic resources should always have geologists involved in a consultation role. The NPS has professional geologists in parks, regions, the Denver Service Center, CPSUs, and the Washington Office. Often, these professionals may not be employed directly as geologists, but their technical services may still be available.

Geologic theories have undergone substantial change in the last two decades. If exhibits and displays were prepared over 20 years ago, they probably need to be updated to reflect current thinking.

In order to comply with the nonconsumptive policy, interpreters can allow the visitors the opportunity to collect specimens for identification by the ranger as an outdoor laboratory experience. The specimens collected will remain in the park.

Geographic features with ethnographic significance for members of groups traditionally associated with the park should be interpreted in a manner which is sensitive to their religious or other beliefs. Interpretation of ethnographically significant geographic resources requires ongoing consultation between the park and the traditionally associated group as well as consultation with a qualified cultural anthropologist.

E. Coordination and Assistance with Geologic Research

The units of the National Park System constitute collectively the greatest geologic preserve in the world and these geologic resources have been extensively studied. This research is vital to the understanding and continued advancement of geology.

The NPS mainly coordinates and facilitates research by other organizations, such as colleges and universities, the U.S. Geological Survey and Bureau of Mines, state geological surveys, and private societies such as the Geological Society of America. Management can support research by encouraging educational institutions and research organizations to study park resources and by helping researchers identify past and ongoing research in the park.

Utilizing CPSUs is one way of encouraging or obtaining geological research. The CPSU mechanism can also function to obtain specialized geologic expertise for the parks. (See also, Chapter 5, Research Administration.)

F. Scientific Specimen Collection

Collecting rocks and mineral specimens for scientific purposes must be authorized by the park superintendent in accordance with requirements of 36 CFR 2.50. The mechanism for scientific geologic sample collection such as rocks, minerals, or fossils is the Specimen Collection permit, covered in 36 CFR 2.5 and NPS-53, the Special Park Uses guideline. See also, Chapter 5, Collections, in this Guideline.

Permits may be issued only to an official representative of a reputable scientific or educational institution or a state or federal agency for the purpose of research, baseline inventories, monitoring, impact analysis, group study or museum display for purposes that are crucial to the institution's

goals. A finding must be made that the appropriate specimens cannot be obtained outside the park and that removal of proposed specimens will not damage the park's resources. Specimen Collection permits must contain conditions concerning labeling, cataloging, and data reporting.

G. Geologic Type-section Localities

A type-section is the original sequence of strata, such as a formation, member, group, or series, described for a given locality or area. There are stratigraphic type-section localities in some units of the National Park System. These are of major importance to that portion of geologic science known as stratigraphy. They serve as a reference point to which all other exposures of a particular stratum in different localities should be compared. They have all been carefully documented by the U.S. Geological Survey and are of geological significance. Identification can be done in conjunction with USGS and state geological surveys. Every effort should be made to locate these sections and document and monument them in some way.

H. Planning

Geologic resource management must be integrated into the planning process. The individual park statement for management and general management plan may have identified areas for consideration for geologic resource management. However, the most effective planning tool for dealing with geologic resources is the resource management plan (RMP). When warranted, an RMP can have an appended action plan for geologic resource management.

II. Specific Geologic Resources

Geologic resources are numerous and diverse, but the program elements of geologic resources management described above can generally apply to them all. Nevertheless, specific consideration is needed based on the park and the geologic resources to be managed. For example, one park may allow beach erosion to continue as part of the natural process, whereas another may take measures to preserve the beach for recreational, economic, or health and safety reasons. The following is a brief description of geologic resources that are of special concern to NPS management.

A. Paleontological Resources

Paleontological resources are any remains, traces, or imprints of plants or animals that have been preserved by natural processes. See Chapter 2, Paleontological Resources Management, for a detailed treatment of this subject.

B. Cave Management

The geologic resource management of caves requires input from a number of diverse and interrelated sources: biology, hydrology (groundwater), speleology (caving), micrometeorology, and

other recreational and scientific interests. However, caves first and foremost are geologic features created by geologic processes and should be treated as such. Cave features and karst activity are in fragile harmony with the rest of the environment. Preservation and protection of this harmony is of the utmost importance in cave management. This may require extensive mapping of the cave system to fully determine the extent of the resource. Research is needed to understand the complex ecological relationships involved in the geological processes that create and maintain the cave system.

More than 20 units of the National Park System have specific cave management plans. See Chapter 2, Cave Resources Management, for a detailed treatment of this subject.

C. Coastal Areas/Shorelines

Coastal and shoreline management entails more than just the geologic resource itself. The migration of barrier islands, sand bars, and dunes, the erosion of beaches and shorelines, and the creation and destruction of lagoons and inlets have impacts beyond the management of the geologic resource solely for NPS purposes. Homes, businesses, the shipping industry, tourism, boating, fishing, and other coastal activities are all greatly affected by how shorelines are managed. Often this is out of NPS control. Management must consider federal, state, and local laws, ordinances, and policies pertaining to shoreline management.

Although basic inventorying of coastal and shoreline resources has been done at many coastal parks, except for those in Alaska, their environmental complexity and dynamism requires far more complete data for effective management. The mechanisms of shoreline processes, such as sediment transport and sea level change, are not well understood. Furthermore, these parks are intensively threatened by both in-park recreational pressures and external activities that have long historical roots and are accelerating with continued coastal zone development. Superintendents should ensure that the forces that form and reshape shoreline features are routinely observed and monitored. This is a major element of the program management. Coastal and shoreline management is discussed in greater detail in Chapter 2, Marine Resources Management.

D. Geothermal Resources

Significant geothermal features in the National Park System have been identified and listed in accordance with Section 115 of the Department of the Interior and Related Agencies Appropriations Act of 1987. The objective is to protect park geothermal resources from impacts of outside activities such as drilling and development of geothermal fields.

Protection and monitoring are the key elements in managing geothermal resources. Because in some instances the temperatures associated with the resources are extremely high, the public must be protected from geysers, hot springs, hot pools, and fumaroles. These features may emit poisonous gases so as to pose additional potential danger to visitors. Because of the fragile nature

of these resources, they must be protected from overuse and abuse. If the situation warrants, it may be necessary to fence, patrol, or otherwise make the resources safe from human interaction. Some geothermal features may be made available for recreational enjoyment, such as bathing.

In most cases, the relationship between geothermal resources and ground water is not clearly understood. The park must always be aware of any proposed changes or developments outside the park that might affect the groundwater system. A long-term monitoring program is the only way to document changes. Water well drilling, oil and gas well drilling, geothermal development, and waste disposal are types of development that can affect geothermal resources. A determination of the status of water rights associated with groundwater withdrawal is often necessary to determine if water rights held by the United States may be injured. For discussions of groundwater and water rights, see Chapter 2, Freshwater Resources Management.

E. Glaciers and Glaciation

The NPS has numerous glaciers under its management. The two primary concerns for managing features and the process should be the safety of visitors and employees, and observation, monitoring, and documentation of the glacier's movements and changes.

If visitors are allowed close to the toe of a glacier, safety is of utmost importance because of the unpredictability of the calving of large chunks of ice that could be harmful. If groups are allowed onto a glacier, precautions should be taken. Glacier travel often locates many parties over time in the same campsites, which necessitates management of human waste disposal. (See Chapter 3, Backcountry Recreation Management for further discussion of human waste management.)

Scientific research should be encouraged and where possible the NPS should participate in the observation and monitoring of the glacier's movements. Careful documentation of the changes should be kept.

F. Volcanoes and Volcanism

The National Park System has both active and dormant volcanoes. The active volcanoes, such as Kilauea in Hawaii Volcanoes, provide an excellent opportunity for the visitor to appreciate the tremendous forces of nature and for the researcher to study the processes of volcanism.

Dormant volcanoes and lava flows are usually massive and can be managed in much the same manner as mountains. Caution should be exercised for safety reasons. Extensive lava flows can cause hikers to become disoriented or lost; the unweathered rock is often very sharp or abrasive and can seriously injure the unwary.

G. Fluvial Features and Processes

Fluvial (river) processes have created some of the most spectacular geologic features of the National Park System. Managing rivers and the geologic processes that build and maintain them may present a management dilemma. NPS policy, in general, is to leave the river resources in their natural state whenever possible. But sometimes the NPS has no choice and the river must be artificially altered through levies, channeling, or the building of dams. Where this has been done, it then becomes the NPS responsibility to manage the river in as close to a natural condition as possible.

H. Erosional Features

Lack of rainfall can create deserts, and that coupled with the erosional forces of wind can create fascinating geomorphic features (landforms). These features include, but are not limited to, sand dunes, arches, natural bridges, hoodoos, and badlands. For the most part, these features are very fragile, and care must be given to their protection. In the context of geologic time, erosional features are temporary and will not remain on earth very long. The most important management actions to emphasize with these resources are protection, monitoring, and interpretation.

ROLES AND RESPONSIBILITIES

I. Park

The **superintendent**, **resource manager**, and, in some cases, **park geologist**, are responsible for "on-the ground" geologic resource management in the park. The park is responsible for the inventory and identification, protection, and interpretation of geologic resources, observation and monitoring of geologic processes, and coordination of, or assistance in, specific geologic research.

II. Region

At the regional level, the **Division of Natural Resources** or the equivalent or the **regional resource manager** most often is responsible for geologic resource management. In some regions, the **regional chief scientist** is responsible for geologic resource management and in all regions they are responsible for geologic research. In some instances, there may be a **regional geologist** in either of these offices. The region is responsible for regional program oversight and consistency of implementation, the inventory of geologic resources, coordination and facilitation of geologic research, providing specialized geologic expertise not available in the parks, and the funding of some activities related to geologic resource management. In addition, the region is responsible for the CPSUs, which can be very effective in obtaining geologic resource information on park issues.

III. Washington Office

The primary Washington Office organizational unit responsible for geologic resource management is the **Natural Resources Directorate.** The Directorate is responsible for geologic resource policy guidance, Servicewide program oversight, interagency coordination, specialized geologic expertise, and funding of Servicewide projects. The Washington Office Land Resources Division, Mining and Minerals Branch, and the Denver Service Center also have expertise in geologic resources management.

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SOIL RESOURCES MANAGEMENT

This section provides guidance in the proper management of soil resources in the National Park System. Mismanagement of this fundamental segment of a park ecosystem will have irreversible effects on all other components of the system. It is essential, therefore, to know and understand the properties of a park's soils so that management, when called for, will be appropriate.

DEFINITIONS

Soil The unconsolidated portion of the earth's crust modified through weathering processes or biological activity into a medium capable of supporting plant growth. It extends from the earth's surface to the lower limit of biological activity, usually about five feet. Soil consists of mineral components resulting from the decomposition of the geologic material making up the earth's crust, biological components, such as organic matter and organisms, and pore space containing air and water in varying percentages. Soils are not static, but are in a dynamic equilibrium with the surrounding environment.

Soil series The kind of soil that forms in a specific location. It is a function of the five factors of soil formation: climate; organisms, including humans; relief (slope); parent material; and time. For example, soils formed from the same parent material in a moist climate will generally contain more organic matter than soils in a dry climate, and weathering will proceed faster and to a greater depth. Moist soil will tend to be more biologically active. Soil forming from a parent material relatively resistant to weathering, such as quartz, will tend to be shallower with fewer well-developed soil horizons (layers) than soils forming in more weatherable materials such as limestone.

Soil type A subdivision of the soil series that recognizes differences in the texture of the surface soil, slope, stoniness, or any of the other features used to define the soil series.

Highly man-influenced soils Soils in which humans have been the dominant soil forming agent. New soil materials often are placed over existing soils, in effect creating a new parent material for soil formation, and a new "time zero" from which soil formation begins. The chemistry and physical conditions of highly man-influenced soils is often unique, a result of inclusion of artifacts of human activity, such as brick, concrete, ash, wood, oil, metal, and other similar materials. It is important to recognize the presence of these soils as their characteristics often preclude use of standard soil management practices.

Mapping unit The name given to a unit of soil with a specific set of unique characteristics. This is the smallest area of soil shown on a soils map.

Natural soils Soils which occur naturally on the landscape, and have physical and chemical properties resulting from natural weathering processes. Their characteristics can be reliably predicted from their landscape position.

Parent material The geologic material from which a soil has formed. This material may be consolidated or unconsolidated, and may exist in its landscape position naturally or through human manipulation.

Permafrost Perennially frozen ground, or ground in which a temperature below 0°C has existed continuously for two or more years. Permafrost is defined exclusively on the basis of temperature, and no moisture or ice need be present. The upper surface of permafrost is known as the permafrost table. The layer of ground above the permafrost which freezes and thaws each year is called the "active layer."

Soil compaction The reduction and redistribution in the amount of total pore space within the soil matrix, usually a result of soil manipulation by human activities, although soil compaction can occur naturally.

Soil genesis The process of soil development from its parent material, as a result of the five factors of soil formation: climate, organisms, relief, parent material, and time.

Soil horizon A soil layer, approximately parallel with the earth's surface, with unique characteristics resulting from its position in the profile. An example is the A horizon, which usually lies at the soil surface and contains more organic matter than other soil horizons in the same profile.

Soil management Manipulation of soil characteristics to achieve a specific goal, such as increased crop production or reduced soil erosion. Soil management may or may not include soil modification.

Soil modification Alteration of specific soil properties, usually in response to identification of a specific soil problem. Soil aeration to alleviate the adverse impacts of soil compaction is an example of soil modification.

POLICY AND PROGRAM OBJECTIVES

I. Management Policy

The NPS Management Policies states:

> The National Park Service will actively seek to understand and preserve the soil resources of parks and to prevent, to the extent possible, the unnatural erosion, physical removal, or contamination of the soil, or its contamination of other resources. Resource managers will create, where appropriate, detailed soil maps, define the distribution of soil series, determine their physical and chemical characteristics, and provide interpretations needed to promote soil conservation and to guide resource management and development decisions.

Potential impacts on soil resources will be routinely monitored. Management action will be taken to mitigate adverse, potentially irreversible, impacts on soil caused by heavy visitor use around major park attractions and facilities. Conservation and soil amendment practices may be implemented to reduce impacts. Importation of nonnative soil amendments or other soil materials may be necessary to mitigate degradation, but this alternative must be deemed appropriate by an agronomist or trained soil management specialist and designed to avoid introduction of exotic species. (4:20)

Wherever practicable, soils and plants affected by construction will be salvaged for use in site restoration. Any surplus soils and plants may be used for restoration of other degraded areas within the park, and surplus soils should be stockpiled for future use. If additional soil and plants are needed to restore disturbed sites, they may be obtained from other sites in the park if it is determined that use of an in-park source will not significantly affect cultural or natural resources or ecological processes. In any case, imported soils must be compatible with existing ones and fulfill horticultural requirements of plants used for restoration. (9:4)

II. Management Objectives

Soil erosion rates should be kept within acceptable limits. Recommendations regarding these limits, along with advice on soil conservation measures, can be obtained from USDA Soil Conservation Service (SCS) and university soil scientists. Examples of erosion control are the use of appropriate vegetative cover at Civil War earthworks, trail maintenance/rehabilitation, and crop rotations on agricultural lands.

Specific objectives can be stated for each management zone. These may be modified somewhat if subzones are identified, but will be consistent with the zone objectives and general policies.

The objectives for each management zone are as follows:

1. natural zone--preserve natural soils and the processes of soil genesis in a condition undisturbed by humans.

2. cultural zone--conserve soil resources to the extent possible consistent with maintenance of the historic or cultural scene and prevent soil erosion wherever possible.

3. park development zone--ensure that developments and their management are consistent with soil limitations and soil conservation practices.

4. special use zone--minimize soil loss and disturbance caused by special use activities, and ensure that soils retain their productivity and potential for reclamation.

III. Program Management

A. Soils Inventory and Mapping

An inventory of all soil resources should be completed for each park. This inventory should include the significant physical and chemical characteristics of the soils important for management of the park. The inventory should be accomplished using standard soil survey terminology and techniques. For new surveys, the assistance of a competent soil scientist should be sought to ensure that an accurate survey is completed. The soils should be mapped at a scale appropriate for the intended use. For example, a soil map created for use in an urban area may require more detail than a survey completed for a rural area.

To begin such an inventory, all existing soil surveys for the park should be obtained. (For information on how to obtain existing soil surveys, see V. Sources of Consultation, below.)

It is particularly important to digitize soil survey information for inclusion in a Geographic Information System (GIS). Soils, left undisturbed by man, tend not to change, so the data become a relatively permanent part of the GIS data base. Furthermore, soil properties are intimately related to other ecological components, such as vegetation type and habitat, and affect or are related to historic resources and current park development efforts, thereby influencing many park activities. The soils theme in a GIS will be one of the most frequently used overlays. Often, soils data can be obtained from the SCS in a digitized format, precluding the need and expense of digitizing an existing map. However, the format of such digitized soils data must be compatible with the park's GIS format.

When a new soil survey is conducted, the information is gathered through examination of soil profiles in the field and laboratory analysis of samples obtained from the profiles. Because digging soil pits for description and sampling is disruptive, compliance with appropriate National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) guidelines must be achieved. Generally, NEPA compliance will not be required because the affected areas are small. However, in areas with significant cultural resources, NHPA compliance will be required to prevent loss or destruction of significant cultural resources, such as at archeological sites.

One of the most common visitor induced impacts in a park is soil compaction and erosion. Some soils are more susceptible to erosion and compaction than other soils. The development of soil surveys in sufficient detail can provide superintendents and planners with the data needed to determine site locations for visitor use developments. These data can help planners minimize the inevitable deterioration that occurs at heavily used sites.

B. Incorporation of Soils Information in Park Management

Facilities proposed for parks in developed and special use zones should be designed with the appropriate soils information at hand. This information will assist managers with proper design and

location of the facilities, thus avoiding problems which would be expensive to correct, if they were correctable at all. Park structures, including roads, can be seriously affected by soil characteristics and must be designed accordingly. Proper design and location of a sewage drain field is an excellent example of a facility requiring soils information.

Proper landscape management, whether in natural, historic, or cultural areas, requires accurate soils information to meet the horticultural and silvicultural requirements of plants.

AUTHORITIES

See the discussion of general authorities in Chapter 1.

RELATIONSHIP TO OTHER GUIDANCE

Information concerning soil management can be found in NPS-28, the Cultural Resources Management guideline, and NPS-53, the Special Park Uses guideline, Appendix 16. In this Guideline, see Chapter 2, Vegetation Management, Freshwater Resources Management, Geologic Resources Management, and Hazardous Waste Management and Chapter 3, Agricultural Uses and Grazing.

PROGRAM GUIDANCE

It is extremely important to consider soil conservation practices as part of all resource management actions or park developments. The following discussion gives guidance for soil conservation under a variety of situations that commonly occur in parks.

I. Landscape Management

Good soil management practices must be followed to ensure protection of the soil resource. Routine monitoring should be conducted to ensure that human actions are not adversely affecting soil ecosystems through increased compaction, erosion, deposition, or other processes. Soil management in natural zones should not be relegated to a "nonmanagement" status since human actions outside the delimited natural zone affect the resource within the zone through accelerated runoff and erosion rates, lack of vegetative cover, land use patterns, etc. Therefore, an inventory of the soil resource should be conducted, and routine monitoring should be performed at an appropriate frequency. It is particularly important that the soil survey identify those areas of the park where soils are susceptible to erosion or other disturbance. The monitoring program should especially focus on those wetlands and erodible and sensitive soils that are easily damaged by human activity. If adverse impacts are found, appropriate soil management practices should be put in place, which may include limiting public access to sensitive areas. The assistance of a competent soil scientist or soil conservationist should be enlisted to ensure that appropriate soil management practices are utilized.

Cultural landscapes should be maintained by an active soil management program to ensure that the horticultural requirements of the landscape plantings are met, to minimize the adverse impacts of human activity upon the soil resource, and to minimize impacts upon landscape plants growing in the affected area. The increased visitation often associated with cultural landscapes results in impacts such as soil compaction and subsequent plant stress. Plant stress results from increased mechanical impedance to root penetration through the soil matrix, reduction in soil oxygen available for root respiration and growth, and lack of nutrient uptake. These plants are then subject to a host of other problems, such as disease, dieback, and insect infestations.

In areas of heavy visitation, soil management should include amelioration of soil compaction. Depending on the nature of the site, one or more of the following soil compaction treatments should be used: aeration, increased irrigation, soil modification with lime, fertilization, addition of composted sludge or other amendments, or complete long-term closure of the heavily impacted site. Routine soil fertility testing may be desirable for some sites (e.g., manmade landscapes in historic parks) to ensure that the horticultural requirements of the landscape plants are being met. It is recommended that a park consult with a professional soil scientist before making decisions on what actions to take to solve a serious soil compaction problem (See V. Sources of Consultation, below.)

II. Agricultural Practices

Several cultivation practices have been developed that can help conserve soil stability and fertility in a park setting. Soil conservation techniques such as crop selection, crop rotation, minimum tillage, grassed waterways, mulching, contour farming, strip farming, terracing, and the use of various soil amendments should be carefully considered when designing a land use plan for a historic district where the interpretive program calls for using agricultural tillage practices. Appendix 16 of NPS-53, the Special Park Uses guideline, provides further guidance on this topic.

III. Importation of Soil

Occasionally a manager may find it necessary to import soil into the park from an outside source. Erosion repair and road or building construction are examples where this need might occur. Such importation of soil should be an effort of last resort. Soil serves as nature's primary "seed bank." Viable seed will almost inevitably be transported along with any soil that is brought into or moved around within a park. Furthermore, soil serves as a reservoir for arthropods as well. Thus, soil importation can bring non-native plants and invertebrates into a park or can introduce new cultivars or races, thus unnaturally altering the gene pool in a park.

When importation of soil is necessary and unavoidable, several options should be considered. Most desirable is to have the soil sterilized to destroy seeds and any plant disease organisms and arthropods that might be contained in it. Obviously, this would be a prohibitively expensive option for large-scale projects. Other actions that should be taken include trying to match the imported soil with native soil properties such as texture, color, structure, clay type, and pH. Selecting a soil

source from as close to the park as possible will help reduce the possibility that inadvertent non-native introductions occur. It is therefore recommended that use of local sources of soil be a selection factor in contracting specifications, especially when the contract is written by other agencies such as the Federal Highway Administration and state highway departments. It is also recommended that the source of the proposed soil be inspected in advance to ensure adequacy of the soil and freedom from non-native plants and non-native arthropods.

One precaution that is often overlooked in soil importations is to ensure that no hazardous materials contamination is present in the soil. Such a clause should be included in the contract or purchase order used to obtain topsoil. The EPA has established the Pollutant Priority List of analyses for soil and water materials, which can identify potential problems. These testing procedures must be followed if suspicion arises concerning a park soil or a specified soil being brought into a park.

IV. Planning and Facility Design

Soil properties can have a dramatic affect on the success of any park development. Unstable soil slopes, poorly drained soils, permafrost, expansive soils, soils with poor water retention capabilities, etc., all have limitations for certain uses. These limitations are inherent and not easily overcome. Such factors must be taken into account in any design or construction. Therefore, it is imperative that soil survey information be obtained and used early in the planning and design phase of any NPS project (See V. Sources of Consultation, below).

V. Sources of Consultation

Several agencies and individuals can provide useful assistance in the management of soil resources. Within the NPS, expertise on erosion control, soil conservation, agronomy, and revegetation techniques can be found in regional offices, Cooperative Park Studies Units (CPSUs), and the resource management staffs of several parks, such as Redwood National Park, with active reclamation programs. The Redwood resource staff can provide good consultation on a variety of soil erosion problems. Some regional offices and CPSUs can provide assistance in the interpretation of soil surveys and investigation of specific soil management problems. The Denver Service Center can provide advice on the implications of soils in land use planning.

The SCS is the lead agency for conducting soil surveys in the United States and their services can be obtained through interagency agreement. If a park soil survey is conducted under contract, the SCS should at least be involved in providing quality assurance and reviewing the products. Additionally, the USDA Forest Service and the Bureau of Land Management frequently have soil scientists or agronomists on their staffs who can provide consultation to nearby parks. These other land management agencies frequently have completed soil surveys for their adjacent lands that can serve as a base for conducting soil surveys on park lands.

State agricultural universities also have soil scientists and agronomists on staff and often conduct surveys in conjunction with research and sometimes in areas not covered by the above agencies.

Independent laboratories are usually available locally for the analysis of physical and chemical properties of soils, although the cost of independent laboratories is usually greater than that of state or federal laboratories.

VI. Scientific Specimen Collection

Collecting soil samples for scientific purposes must be authorized by the park superintendent in accordance with requirements for 36 CFR 2.50. The mechanism for scientific sample collections is the Specimen Collection permit, covered in 36 CFR 2.5 and NPS-53, the Special Park Uses guideline. See also, Chapter 5, Collections, in this Guideline.

ROLES AND RESPONSIBILITIES

I. Park

The **superintendent** ensures that soil properties and limitations are considered in park development and project plans, and that NEPA and NHPA compliance has been completed for soil surveys and site investigations. The superintendent also incorporates soil conservation techniques in park management and activities.

The **park resource manager**

- incorporates soil conservation techniques in park management and activities,
- identifies the need for soil surveys and site analysis and incorporates these needs in the current resource management plan for the park,
- provides guidance and advice to the park staff on soil use limitations and conservation techniques,
- seeks soil inventory and analysis information from local, state, and federal agencies,
- seeks advice and guidance on soils management from specialists within and outside of the NPS,
- performs appropriate environmental compliance on proposed soil surveys or seeks the assistance of specialists capable of performing adequate compliance, and

- identifies soil sources within and outside of the NPS units that will provide soils of the desired properties while minimizing the opportunity for introducing exotics and their impact on park resources.

The **park scientist** or **CPSU scientist**

- provides guidance and advice to superintendents, resource managers, and regional office personnel in the interpretation of soil survey information and soil conservation techniques,
- conducts or contracts for soil surveys and analysis of soil properties at specific sites,
- identifies the level of soil survey that is needed and the areas to be surveyed, and
- identifies and obtains soil inventory information that may be available from government agencies, individuals, or published literature.

II. Region

The **Regional Director** reviews park development and project plans to ensure that soil properties and limitations have been identified and incorporated, ensures that adequate environmental compliance has been conducted on soil survey and other soil investigative actions, and makes technical guidance and advice available to superintendents in the interpretation of soil survey information and soil conservation techniques.

III. Washington Office and Denver Service Center

The **manager of the Denver Service Center** ensures that soil properties and limitations are identified and incorporated in the planning, design, and construction of parks and facilities; obtains soil surveys and/or site specific soil analysis information as needed to facilitate project planning design and construction; and provides advice, guidance, and information to parks and regional offices with respect to soil properties and limitations.

The **Director**, through the Associate Directors for Natural Resources, Cultural Resources, and Operations, establishes policy and goals for the management of soil resources and maintains a liaison with other government agencies that can provide special expertise and assistance to the Service in the management of soil resources.

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CAVE MANAGEMENT

Caves and shelter caves are a significant component of many NPS units, and some parks have been specifically established to protect cave and karst areas. Within the National Park System are some of the nation's most outstanding caves, including what is perhaps the longest cave in the world, a cave containing the largest gypsum speleothems in the world, and caves of great economic importance. Many caves in parks are important as hibernacula and maternity sites for bats. While often misunderstood and overlooked in integrated land management schemes, caves can present a manager with unique conditions and challenges and with some of the most complex and intricate hydrological and ecological systems within a park.

The objective of this section is to provide guidelines for the management of caves in a manner that will encompass the many disciplines that need to be applied to protect and perpetuate natural cave systems. Some of the guidance in this section is oriented toward developed caves and parks with a few major caves. Parks with small, undeveloped caves should adapt such guidance to fit their own conditions. Examples of cave classification and inventory systems are provided in Exhibits 1 and 2.

DEFINITIONS

Cave The Federal Cave Resources Protection Act defines a cave as any naturally occurring void, cavity, recess, or system of interconnected passageways beneath the surface of the earth or within a cliff or lodge that is large enough to be traversed by people, whether or not the entrance is naturally formed or manmade. The term includes any natural pit, sinkhole, or other feature which is an extension of the entrance. Types of caves include lava tubes, limestone and gypsum caves, tectonic fractures (earth cracks), littoral (sea) caves, ice caves, and talus caves.

Rock shelter A concavity in rock that may not have extensive passageways but is a large enough cavity or rock overhang to provide shelter for humans. Rock shelters usually do not extend into total darkness.

Karst A landform comprised of sink holes, underground passageways or water courses, and spring resurgences, usually occurring in a soluble rock such as limestone or gypsum.

Sinkholes A depression or pit in the earth caused by the chemical dissolution of rock.

Speleothems A secondarily deposited mineral feature that occurs in a cave, such as a stalactite, stalagmite, flowstone, or helictite.

POLICY AND PROGRAM OBJECTIVES

The NPS Management Policies states:

> Caves will be managed to perpetuate their atmospheric, geologic, biological, ecological, and cultural resources in accordance with approved cave management plans....Natural drainage patterns, air flows, and plant and animal communities will be protected. (4:20)

It further states that:

> Caves with all entrances in wilderness will be managed as wilderness. (6:3)

The major objectives of a park's cave management program should include:

1. protection and perpetuation of natural cave, karst, and hydrological systems;

2. opportunities for scientific studies and research in or about cave and karst resources and systems;

3. detailed inventory of resources within cave systems;

4. provision of educational and recreational opportunities for a broad spectrum of park visitors to discover, explore, study, respect, appreciate, and enjoy caves at their individual levels of interest and abilities; and

5. establishment of regulations, guidelines, and/or permit stipulations that will ensure maximum safety of the cave visitor and conservation of cave resources.

It is important to understand that most cave resources are nonrenewable and any entry into a cave may have an irreparable impact on that cave. Therefore, cave management objectives for an individual park must be based on sound resource inventory and followed up by appropriate monitoring. Objectives should also prohibit the use of explosives or mechanical rock-moving devices for cave exploration. It is also important to prohibit the use of gasoline or other fossil fuels for powering tools or other devices inside caves.

AUTHORITIES

NPS authority for the management of cave resources comes from the general authorities discussed in Chapter 1 and from the Federal Cave Resources Protection Act of 1988.

The Federal Cave Resources Protection Act states that:

(1) significant caves on Federal lands are an invaluable and irreplaceable part of the Nation's natural heritage; and

(2) in some instances, these significant caves are threatened due to improper use, increased recreational demand, urban spread, and a lack of specific statutory protection.

The stated purposes of the Act are:

(1) to secure, protect and preserve significant caves on Federal lands for the perpetual use, enjoyment, and benefit of all people; and

(2) to foster increased cooperation and exchange of information between governmental authorities and those who utilize caves located on Federal lands for scientific, education, or recreational purposes.

The Act establishes that "It is the policy of the U.S. that Federal lands be managed in a manner which protects and maintains, to the extent practical, significant caves."

The Act specifically addresses the use of "confidentiality of information concerning the nature and location of significant caves" to ensure protection of the resource (16 USC 4304):

> Information concerning the specific location of any significant cave may not be made available to the public...unless the Secretary determines that disclosure of such information...would not create a substantive risk of harm, theft, or destruction of such cave.

RELATIONSHIP TO OTHER GUIDANCE

In order to comply with the intent of the Federal Cave Resources Protection Act of 1988, cave resources must be inventoried or existing inventories used to determine the significance of individual caves. A special directive is being developed to comply with this mandate. NPS-14, the Cave Radiation Safety and Occupational Health guideline, also directs cave management activities when developed caves or caves into which the public is guided on a regularly scheduled basis are involved.

PROGRAM GUIDANCE

The following section addresses cave permits; visitor use monitoring; and cave protection, maintenance, restoration, research, and development. Other guidance can be found in exhibits at the end of this section. Exhibit 1 is a cave classification system suggested as a guideline for developing a cave management section within a general management plan. Exhibit 2 presents cave inventory procedures. The guidelines in these exhibits can be adapted to fit individual park needs.

The inventory and classification process should consider paleontology, archeology, biology, geology, mineralogy, hydrology, and other considerations to integrate caves into the overall management of the park's ecosystems.

I. The Cave Permit Program

Acquisition of the Park User Fee is used to authorize visitor entry into developed caves (Class 1; see Exhibit 1) during normal visiting hours. Entrance to undeveloped caves or cave passages should be restricted to those holding approved cave permits, except for park maintenance or management personnel. Prior to a proposed trip, a written application should be submitted for approval by the superintendent. A signature of approval on the application form constitutes a valid permit under the conditions of the form. Solo expeditions should not be permitted.

Anyone that demonstrates incompetence, failure to cooperate, negligence, or other actions detrimental to their own or the group's safety or to the cave resources, may be denied a cave permit. All incidents should be documented and the chief ranger notified as soon as possible. Failure of all trip members to sign the permit request before entry into the cave invalidates the permit.

II. Visitor Use Monitoring and Resource Protection Programs

A. Visitor Use Monitoring

Because most cave resources are nonrenewable, it is important that the impact of various types and intensities of use be carefully and systematically documented. In this way, acceptable levels of use can be anticipated and a reasonable carrying capacity established for each cave before irreparable damage is done. This process needs to be initiated in all caves, particularly in newly discovered caves. Because of individual variation, each cave should be monitored and its management evaluated separately. Carrying capacity is established from the correlation of two important types of information: (1) cave use and (2) the measured condition of the resource associated with various levels of use. The resource used to evaluate impact must be accurately measurable with a consistent technique, and its condition must be correlated with the presence of people in the cave.

1. Techniques

a. Visitor use

Cave use at a developed cave may be determined by mechanically or optically counting people on the elevators, as they exit the cave, by ticket sales, or by a ranger guide. The cave permit provides use data for undeveloped caves. Many of the caves whose use is regulated are not gated; therefore, the accuracy of use data generated from approved permits is dependent largely on voluntary compliance with entry procedures.

Quantitative and qualitative measurement of cave resources is generally more difficult than measuring visitation. Within a park, the monitoring of cave vistas and, when possible, water quality provides principal indices of cave use impacts. In developed caves, cave microclimate may also be monitored.

b. Photo and video monitoring

Vistas are measured using a system of fixed photopoints and videopoints established at selected sites within the cave. Each site is marked with an unobtrusive identification tag. These photos and videos provide comparative qualitative and quantitative data for any resources visible within the photograph.

c. Pool monitoring

Aquatic systems are vulnerable to alteration by people and include indices of change that are relatively easy to measure. Ions, turbidity, and other parameters that are likely to be altered by human activity may be monitored periodically where feasible to quantitatively measure any change within the cave.

2. Safety Monitoring Program

a. Search and rescue

Cave related search and rescue activities and tactics should be outlined in the park's search and rescue plan, an appendix to the emergency operations plan.

b. Radon monitoring

Levels of alpha radiation within some caves are sufficiently high to warrant setting limits of exposure based on the highest monthly readings recorded within the cave. The radiation is caused primarily by radon 222. Some additional radiation is generated by radon 220 (Thorium). Working levels of alpha radiation are measured from the radon daughters, and exposure records are maintained for all employees. Backcountry caves are monitored when feasible. In managing alpha radiation hazards, the park must follow the procedures specified in NPS-14, the Cave Radiation Safety and Occupational Health guideline. Alpha radiation is no threat to park visitors. The only known health effect associated with exposure to radon and radon progeny is an increased risk of developing lung cancer. Due to the potential hazard of exposure to radon and radon progeny to NPS employees, special use visitors, and contractors of the NPS, radon exposure records and monitoring must be done in accordance with NPS-14.

As required by 36 CFR 2.21(B) and NPS-14, smoking by employees and visitors in caves is prohibited, because of the synergistic health effect of smoking and exposure to radon progeny, and to preserve cave resources.

B. Resource Protection

1. Preferred Techniques

Preferred means of cave protection are (1) confidentiality of cave locations, (2) ranger patrols, and (3) use of interpretive media to help people appreciate caves and understand the fragility of cave resources. Interpretation is an extremely important management tool since it encourages voluntary compliance and cooperation in protecting essentially nonrenewable resources.

2. Gates

Gates are an obtrusion on the aesthetic integrity of the cave entrance and are often deleterious to the ecology of a natural cave, hindering or entirely impeding airflow and the movement of bats and other organisms into and out of the cave. The use of gates to prohibit unauthorized entry is often unsuccessful against determined vandals. This technique should be used to protect park caves only where the need is considered essential and a biologically neutral gate can be constructed. The entrance to many caves is so large that gates are not feasible. Interior gates may be used to restrict access to areas of significant hazards (e.g., Class V; see Exhibit 1) or which merit special resource protection (e.g., Class 5 or 6).

3. Cave Alteration Conditions

During cave exploration an area may require enlarging to permit entry into virgin passageways or chambers. Permission to enlarge a constriction, or to dig through breakdown or cave fill, must be obtained in writing from the park superintendent. Environmental alterations and potential damage to cave resources should be given the highest priority consideration before permission to alter a cave is given. Explosive charges or mechanical devices, such as "rock splitters" or "jackhammers," should not be permitted for use in park caves except for pre-approved construction uses within the developed caves.

III. Maintenance Standards

With the exception of park concession facilities and contracted work, the Maintenance Division is usually responsible for the upkeep of all underground facilities. This includes the necessary cleaning, repair, and renovation of cave trails, electrical systems, lights, elevators, restrooms, and the sewage collection and evacuation systems.

The Maintenance Division is responsible for assuring that the techniques used do not degrade the cave beyond the trails or other cave developments. Routine maintenance functions, such as changing lights, electrical wiring, and trash collection may require stepping off designated trails. In these instances every effort should be made to obliterate any footprints on the cave floor. The bottom of footwear should be cleaned before stepping back onto any paved trail. Visible footprints on or off the trail could encourage visitors to leave the trail and damage delicate cave areas.

During maintenance projects in the cave, tools and materials left in work areas for extended periods and not in actual use should be concealed from public view. Foreign substances that will wash or roll off developed areas and enter natural cave areas should not be used. Cave trails may be periodically washed to remove silt and foreign material buildups that create a slick and hazardous trail surface. Where possible, washings will be collected from the trail surface and removed from the cave. Artificial speleothems should not be created for the purpose of concealing lights or other objects. However, such foreign objects should be concealed using natural features to the extent feasible, as long as the cave is not further altered by such action. Chemical-containing products used by maintenance and concession personnel should be approved by the superintendent and/or resource manager before use in order to investigate the potential for causing damage to cave resources.

Many of the facilities within the cave, especially lights and electrical wires, are located in areas where maintenance access requires special skills (e.g., rope work). Although the Maintenance Division may use available expertise in other divisions to provide such skills, the Maintenance Division should attempt to have personnel that are trained to safely use vertical equipment and move about the cave without damaging the resources. Having such expertise available within the Maintenance Division may be particularly important during an emergency.

The use of internal combustion engines in the cavern environment should not be permitted. Such use is detrimental to the biota of the cave, and a hazard to employee health.

IV. Cave Restoration Programs

Any visitation in caves causes some direct degradation of cave resources. In developed caves, foreign materials resulting from human use, such as lint, algae, and fungi are a problem. To help maintain a natural cave environment, these materials must be routinely removed. Trips into off-trail areas, and into undeveloped caves, often result in mud buildup on flowstone areas. These areas should be monitored and cleaned periodically.

Other cave restoration activities are of a nonroutine nature, such as restoring scars from construction projects. Old trail fills and areas damaged by development can be partially restored by careful work and research. Care must be taken in establishing trails through any cave. Speleothem breakage is very difficult to restore.

No chemicals harmful to people or to the cave's ecosystems should be used in restoration work. Cave restoration work in both developed and undeveloped caves should be scheduled and supervised by qualified resource management staff. This type of activity should not be undertaken by untrained persons; knowledge of caves is of the utmost importance. Restoration projects requiring specialized knowledge or skills not available in the park staff should be performed by experienced persons on a contract basis.

Direct and indirect effects of all restoration techniques should be carefully monitored to help ensure protection of the cave environment. A cave restoration log should be maintained to document both the details of restoration activities and the results of restoration impact monitoring. Individuals or groups involved in cave restoration work are responsible for the removal of all evidence of their activities (e.g., footprints, tools) from work areas.

V. Research Guidelines

Considerable cave research is conducted within parks. Although the NPS occasionally funds studies to aid in the resolution of cave management problems, the majority of cave research is contributed by individuals interested in studying caves. Any competent researcher with a proposed project that is consistent with NPS policies, and likely to contribute to the management and understanding of park resources should be encouraged to work in the park. Research proposals must be approved by the superintendent (see also, Chapter 5, Research Administration).

VI. Conservation Guidelines for a Developed Cave or Cave Development

A. Planning

In planning development of a cave, observe the following points:

1. Prior planning must give ample justification for the need for development of any cave resource.

2. Choose carefully before a cave is developed. Resources in some developed caves cannot be protected no matter what resource management techniques are used. Test for safety hazards (rock failure, radon concentrations, molds, rabies, histoplasmosis, etc.).

3. Establish baseline data on infiltration rates, cave life, and cave climate (especially humidity and carbon dioxide percent) over at least a year's period before any changes are made. Have the cave surveyed by a professional archeologist and hydrologist. Consult other professionals.

4. Plan for development before any changes are made in the cave. It is impossible to protect some resources if mistakes are made in initial development. Initial mistakes multiply expense and damage.

5. Restrict development above the cave or within its drainages (which may be different from surface drainages). Concentrated, hydrocarbon-rich discharges from buildings, parking lots, buried gas or sewer tanks, etc. can cause irreversible changes in caves and/or surface collapse.

B. Construction

Follow these guidelines:

1. Don't use toxic construction material. Avoid using material derived from the cave except for loose rocks used in hiding wires where absolutely needed.

2. Construct trails so that they will not approach delicate formations too closely. Raised trails reduce off-trail damage, reduce construction damage, and permit free flow of water along natural channels.

3. Wire the electrical system into the trail system and minimize wiring across the cave. Don't bury wire in flowstone and speleothems; replacement would be destructive. Use loose cave material derived from trail construction to hide wires but do not cement permanently in place. Break up wire coverage; i.e., do not use rows of rocks. Concrete soaked nonorganic cloth used to hide wires can later be easily removed.

4. Install stainless steel railings with at least three horizontal bars and at least one meter (three feet) high. Low rock walls are too easy to trip over. Lawsuits can result without adequate attention to visitor and employee safety.

5. Install a proper drainage system for the trail so as to adequately catch, remove, and/or filter water from trail cleaning. Do not use cave pool water for cleaning or monitoring (e.g., filling evaporation pans) when outside water can be used if chemically compatible. Be mindful of coloration in water.

6. Install noncolored, full spectrum fluorescent lights of sufficient intensity to see safely, but not enough to cause extensive algal growth (if lights other than fluorescent are used, measure foot candles to ensure they are not promoting the growth of algae). Bleach effectively kills algae, but use at a minimum and never allow it to run into pools.

7. Build gates that will permit both animals and air to freely exit and enter the cave. Weld on case-hardened material to inhibit hacksaw use.

ROLES AND RESPONSIBILITIES

I. Park

The **superintendent** is directly responsible to the Regional Director for cave management activities within the park. The **park staff** is responsible for the inventory and classification of cave resources, protection of cave resources, interpretation, observation and monitoring, and the coordination of or assistance in specific cave research. If the park has developed caves, the park staff also has the responsibility for maintaining trails and all other NPS facilities above and in the cave. In some

parks there may be a **cave specialist** who is responsible for advising and consulting with other staff specialists, such as the resource manager, chief of interpretation, or others on cave-related resource management concerns or problems including, but not limited to, research, maintenance, inventory, and protection activities.

II. Region

The **regional chief of resources management** is primarily responsible for cave resource management at the regional level. The **regional chief scientist** is responsible for research. The region is responsible for regional program oversight and consistency of implementation, the inventory of cave resources, coordination and facilitation of cave research, providing specialized cave expertise not available in the parks, and funding some activities related to cave resource management.

III. Washington Office

The primary Washington Office organizational units responsible for cave resource management are the **Ranger Activities Division** and the **Wildlife and Vegetation Division.** The Wildlife and Vegetation Division is responsible for policy development and oversight of the technical and scientific aspects of cave resource management. The Ranger Activities Division is responsible for visitor-related aspects of cave management.

CLASSIFICATION SYSTEM - EXHIBIT 1

This cave classification system consists of a three-element code rating made up of (1) a numeral indicating type of management, (2) a letter indicating resources contained in the cave, and (3) a Roman numeral indicating its hazard rating. A cave coded "2-D-II" describes an undeveloped cave that could be visited with an NPS trip leader (Management Class 2), contains speleothems of unusual quality (Resource Class D), and has moderate hazards with primarily horizontal passages (Hazard Class II). (Details of the individual code elements are explained below.)

No cave will fit exactly into one individual category within this or any other classification system, but past experience in using this system in several federally administered cave and karst areas has proven its effectiveness. For example, a Class III cave need not necessarily have a vertical drop up to 15 meters, as long as the other general characteristics are descriptive of the cave. It will be necessary, particularly with large or extensive caves, to assign different classification ratings that may vary seasonally in order to minimize interference with, or safety hazards resulting from, natural processes and populations.

A cave's rating may be changed as a result of findings from additional explorations or by the alteration or removal of a hazard or resource responsible for the initial rating.

A cave's rating should reflect not only what the caver encounters within the cave but also what is encountered in reaching the cave. This should be explained as part of the description of the cave (see Exhibit 2, item II A.8).

I. Management Classes

A. Class 1 Caves

Class 1 caves are developed caves. These include two types: (1) highly developed caves and (2) minimally developed caves.

Highly developed caves are managed to provide a visitor maximum comfort and convenience (e.g., hard-surfaced trails, handrails, electric lights, sanitation facilities, concession services, and elevators) and a variety of interpretive media (e.g., electronic self-guided tours, interpretive signs, and ranger talks). The highly developed cave provides an opportunity for most visitors to tour the cave without special clothing, equipment, knowledge, or skills. It fulfills the desires of most visitors and permits large numbers of people to tour the cave daily.

Minimally developed caves are managed to provide relatively easy access with minimal modification of cave resources. Development normally consists of a designated trail following an easy-to-walk route. This fulfills the needs of those that wish for a more natural cave experience without requiring special skills or equipment.

B. Class 2 Caves

Class 2 caves are undeveloped caves that may be visited only when scheduled in advance and when the visitor is accompanied by a designated NPS trip leader. Scheduling of trips into Class 2 caves is subject to the availability of a qualified trip leader. Class 2 caves contain sensitive natural and/or cultural resources, often of unusual quality. Trip leaders are responsible for interpreting the cave and for ensuring that each group takes all feasible precautions to leave the cave unimpaired for future visitors.

Although access in some caves may be relatively easy, it may be quite difficult in others, requiring crawling and/or extensive vertical work. Participants should be required to furnish their own equipment. These trips are for people that desire a wild caving experience and may require specialized skills.

C. Class 3 Caves

Class 3 caves are undeveloped caves that may be visited by permit without an NPS escort. The resources within these caves are less easily impacted than in Class 2 caves and they can be enjoyed without incurring significant alteration if groups are conscientious and conservation minded. Class 3 caves vary from those that are easily accessible to very difficult caves that require crawling and/or extensive vertical work. Permittees are responsible for providing their own equipment. Evidence of incompetence, previous cave abuse, or disregard for park regulations constitutes grounds for denying a permit.

D. Class 4 Caves

Class 4 caves are closed to general use pending further evaluation for designation in another management category. Caves are designated Class 4 because they are newly discovered and require further exploration and/or inventory to evaluate how they should be managed; they have been explored and known for years but have not been sufficiently inventoried; or they are potential Class 2 or 3 caves that have been well-explored and inventoried, but are being withheld from reclassification pending the results of resource impact studies on caves currently being managed as Class 2 or 3. Class 4 caves that have been explored and inventoried and are pending reclassification as Class 2 or 3 caves may be opened to small, guided groups. Such trips should be authorized only for groups with a bona fide instructional need or for NPS personnel involved in cave interpretation. Otherwise, Class 4 cave entry is approved only for minimum administrative purposes and research.

E. Class 5 Caves

Class 5 caves are closed to general use because they contain paleontological, archeological, historic, ethnographic, or other resources of special scientific value that would be easily altered, even by careful use of the cave. Approved research use only is allowed. Though only certain caves are

reserved for research, this does not exclude research from other park caves. Designation of certain caves as research caves does not exclude administrative entry to monitor research activity and impacts upon these caves.

F. Class 6 Caves

Class 6 caves are closed to all use except the minimum required for administrative entry. These caves are closed because they have extremely hazardous passages, even for the most skilled caver; are difficult to enter without causing irreparable damage to extremely fragile resources; or contain an endangered species that could be threatened by visitor use.

II. Resource Classes

A. Class A Caves

Class A caves contain few or no features of scenic or scientific value. If such resources are present within the cave, they are of the type that cannot, without great effort, be destroyed or removed. Basically, these are caves in which frequent visitation by cavers will involve an acceptable level of degradation.

B. Class B Caves

Class B caves contain speleothem or other resources of scientific value that, because of their size or their location within the cave, are not easily subject to vandalism, disruption, or destruction by visitor use.

C. Class C Caves

Class C caves contain speleothems that are either of such size or so positioned within the cave that they are unusually susceptible to breakage and/or vandalism. Other resources of scientific value that could be seriously disturbed or destroyed by visitor use may also be found in Class C caves.

D. Class D Caves

Class D caves contain speleothems that are of unusual quality and/or are extremely delicate and susceptible to breakage, or resources of scientific value that could be seriously disturbed or destroyed by cavers. Examples of Class D speleothems include selenite needles, gypsum flowers or hair, epsomite or mirabolite formations or crystals, and helictites.

E. Class E Caves

Class E caves contain resources of scientific value that could and/or would be seriously disturbed by frequent visits, or by visits of cavers unfamiliar with the cave's unique resources (e.g., biological

species that have a sensitive habitat or are otherwise threatened). Scientific resources may be either archeological, ethnographic, biological, or paleontological in nature, or they may be rare speleothems.

III. Hazard Classes

A. Class I Caves

Class I caves offer the least hazard to the caver. Experience indicates that exploration should generally be conducted by no less than three cavers, who observe caving safety rules and use the following basic equipment: hard hats, three light sources per person, boots with nonskid soles, and protective clothing.

The following are general characteristics of Class I caves:

1. single, well-defined main passageway with no lateral passages;
2. no passageways less than 60 centimeters (24 inches) in diameter;
3. no step-type drops over one meter (three feet);
4. no known loose ceiling rocks; and
5. few loose rocks on the floor.

B. Class II Caves

Class II caves contain moderate hazards and are mostly horizontal in structure. Experience indicates that exploration should be conducted by no less than three cavers, one of whom is experienced, who observe caving safety rules and use the following basic equipment: hard hats, three light sources per person, boots with nonskid soles, and protective clothing.

The following are general characteristics of Class II caves:

1. well-defined main passageways with only dead-end lateral passages;
2. crawlways less than 60 centimeters (24 inches);
3. no step-type drops over three meters (10 feet);
4. no known loose ceiling rocks; and
5. loose floor material.

C. Class III Caves

Class III caves contain structural hazards not found in Class I and II caves. Experience indicates that exploration should be conducted by no less than three cavers, two of whom have moderate caving experience(including vertical descent and climbing), who observe caving safety and vertical safety rules, and use the following basic equipment: hard hats, three light sources per person, boots with nonskid soles, vertical descent and climbing gear, and protective clothing with no loose or protruding attachments that might become entangled while doing vertical work. Each caver should have a complete set of climbing equipment. (Note: Vertical equipment may not be needed in some Class III caves.)

The following are general characteristics of Class III caves:

1. multiple passageways with straight connecting passages;

2. vertical drops up to 15 meters (50 feet); and

3. loose rocks on ceilings over two meters in height and no known loose rocks on passages less than two meters (six feet) high.

D. Class IV Caves

Class IV caves are the most hazardous from a structural standpoint. Experience indicates that exploration should be conducted by no less than three cavers, all of whom have considerable caving experience (including vertical descent and climbing), who observe caving safety and vertical safety rules, and use the following basic equipment: hard hats, three light sources per person, protective clothing with no loose or protruding attachments that might become entangled while doing vertical work, and vertical descent and climbing gear. Each caver should have a complete set of climbing equipment.

The following are general characteristics of Class IV caves:

1. maze-type passageways;

2. vertical drops over 15 meters (50 feet); and

3. loose ceiling rocks on crawlways under two meters (six feet) high.

E. Class V Caves

Class V caves are extremely hazardous due to characteristics such as airborne diseases, dangerous gases, flooding, or unstable rock. Class V caves should only be entered by qualified cavers with special equipment, and only if the need for information is proportionate to the risk involved. Extra

safety precautions should be taken, and special communications and rescue capabilities should be available.

CAVE INVENTORY PROCEDURES - EXHIBIT 2

Inventory procedures consist of identifying cave locations and noting each cave's contents, significance, hazards associated with its exploration, and other specific information. Uniformity of interpretation can best be accomplished by individuals experienced in caving using standard criteria.

I. Cave Identification

A. Cave Number

Each cave should be numbered according to established and documented guidelines.

B. Cave Name

When a cave has an established name, this should be retained.

C. Cave Markers

A brass cap may be set at the entrance of each cave. The cave number should be stamped on the cap.

D. Cave Location Map

Each cave will be plotted on a mylar overlay as part of the park's 7 1/2 minute RBI/Ecosystem map series. Since confidentiality of cave locations is critical to the protection of cave resources, the maps will not be available for public viewing. Cave locations will be designated by a circle. Cave numbers will be shown on the map. Cave locations should be incorporated into the park GIS.

II. Cave Record and Files

A. Individual Cave Files

A file for each cave will be maintained separately from the regular files. Each cave file should contain the following:

1. when found
2. by whom
3. other people present
4. how located

5. how and why named

6. topographical map of area, showing the location of the cave

7. directions for reaching the cave entrance

   a. road log by tenths of a mile

   b. walking distance, both vertical and horizontal

   c. approximate walking time at an average pace

   d. pedometer log and step log

8. detailed descriptions of hazards present within the cave and/or in reaching the cave entrance, including recommended equipment and procedures for reaching, entering, and exploring the cave

9. detailed description of major features of the cave, including speleothems, fauna, flora, biological, hydrological, geological, archeological, ethnographic, paleontological, etc.

10. recommendations on type and amount of use restrictions

11. map of the cave, including plan view, vertical section, and all survey computation notes

12. photographs showing the cave's entrance and at least the cave's major areas and features. Notation will include the photographer and the date the photographs were taken.

13. significant trip reports

14. permanent record, listing date of each cave entry and number of cavers on each trip

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PALEONTOLOGICAL RESOURCES MANAGEMENT

Paleontological resources are the only direct evidence of past life. They are the basis for our understanding of the history of life on Earth and are an integral part of our planet's biodiversity.

The NPS has paleontological resources in many, if not most, of its units. In fact, a number of parks have been established specifically to protect fossil resources and these areas are known in the international scientific community as outstanding windows onto the life of the past.

Paleontological resources in the National Park System are exceedingly diverse. In size they range from microscopic pollen to dinosaur skeletons over 100 feet in length. In age, they range from only a few thousand years to over a billion years old. While some fossil organisms are known from only a single specimen, others are so abundant that they are the major component of some rock formations.

This section provides guidance to park managers in managing and protecting paleontological resources.

DEFINITIONS

Fossil Any remain, trace, or imprint of a plant or animal that has been preserved by natural processes in the earth's crust from some past geologic time.

Paleontological resources Fossil resources, including both body and trace fossils, of all groups of organisms (vertebrates, invertebrates, plants, pollen and spores, etc.).

Paleontology The study of life in past geologic times.

Preparation The removal of matrix from fossils using mechanical and chemical means, and the stabilization and/or repair of the specimens.

POLICY AND PROGRAM OBJECTIVES

NPS Management Policies states that:

> Paleontologic resources, including both organic and mineralized remains in body or trace form, will be protected, preserved, and developed for public enjoyment, interpretation, and scientific research in accordance with park management objectives and approved resource management plans.
>
> Paleontological research by the academic community will be encouraged and facilitated under the terms of a permit when it meets all the following criteria:

The project cannot be conducted outside the park and involves more than simple collection of additional specimens of types already collected.

The project will answer an important question about the resource.

Information obtained through the research will be made available to the park.

Management actions will be taken to prevent illegal collecting and may be taken to prevent damage from natural processes such as erosion. Protection may include construction of shelters over specimens for interpretation in situ, stabilization in the field, or collection, preparation, and placement of specimens in museum collections. The localities and geologic settings of specimens will be adequately documented when specimens are collected. (4:19)

Protection may also include, where necessary, the salvage collection of threatened specimens that are scientifically significant.

The program objectives of paleontological resources management are

1. to identify paleontological resources within NPS units,

2. to evaluate the significance of those resources,

3. to adequately protect significant resources such that their scientific, interpretive, and/or historical value is not degraded, and

4. to use the results of such research to further management objectives.

AUTHORITIES

In addition to the general authorities discussed in Chapter 1, there is more specific legislation related to paleontological resources. In instances where paleontological resources happen to occur in an archeological context, the fossils fall under the enhanced guardianship offered to the latter discipline through the Archaeological Resources Protection Act of 1979. Section 3 of that Act, as amended, specifically excludes nonfossilized and fossilized paleontological specimens from the Act's authorities unless those specimens are found in an archeological context. This exclusion is reaffirmed in section -.3(a)(4) of the Act's uniform regulations (43 CFR 7; 36 CFR 296; 18 CFR 1312; 32 CFR 229), which states that paleontological remains "shall not be considered of archaeological interest, and shall not be considered to be archaeological resources...unless found in a direct physical relationship with archaeological resources...." Archeological resources are defined in section -.3(a) of the uniform regulations to mean "any material remains of human life or activities which are at least 100 years of age, and which are of archaeological interest."

Although the Antiquities Act does not specifically mention paleontological resources, from 1908 to 1977 the Department of the Interior administratively interpreted "objects of antiquity" to include paleontological resources, and issued permits for paleontological research on its lands under the authority of the Act. In 1974, in United States v. Ben Diaz, 499 F. 2d 113 (9th Cir. 1974), the Ninth Circuit Court of Appeals found the phrase "object of antiquity" to be unconstitutionally vague because the Act uses undefined terms of uncommon usage. In 1977, the Solicitor's Office advised the Assistant Secretary for Fish and Wildlife and Parks that the courts could very likely interpret the Antiquities Act as not including paleontological specimens. The Solicitor's Office reaffirmed this position in 1986 when it advised the Bureau of Land Management that the Antiquities Act is not to be relied upon as providing authority for any fossil management program administered by the Bureau.

RELATIONSHIP TO OTHER GUIDANCE

NPS-28, the Cultural Resources Management guideline, provides guidance which is applicable in the case of paleontological specimens occurring in an archeological context. NPS-53, the Special Park Uses guideline, provides guidance for permitting for scientific activities in general, with an appendix pertaining specifically to paleontological research. The NPS Museum Handbook, Part II, describes the procedures for accessioning and cataloging NPS museum collections. 36 CFR 2.5 stipulates cataloging requirements for NPS specimens permanently retained in park museum collections.

In this Guideline, see also Chapter 5, Special Use Permits, Research Administration, Collections, and Inventory and Monitoring.

PROGRAM GUIDANCE

I. The Nature Of Fossil Resources

There are numerous types of fossils representing most of the taxa in existence today and extinct groups, as listed in the Hierarchical Classification Outline (HCO) of the NPS Museum Handbook, Part II. Both botanical and zoological fossils are of two types: body fossils and trace fossils. Body fossils are remains of the structure of the plant or animal itself, including both hard tissues (e.g., bones, shells, seeds) and soft tissues (such as skin, leaves, cells). Trace fossils are the result of activities, such as tracks, root traces, coprolites, nests, middens, burrows, and borings. Both body and trace fossils need to be considered as paleontological resources by park managers.

Fossils are a nonrenewable resource. There is a finite number of fossil specimens for any given species, and that number is always decreasing as specimens are destroyed by erosion.

II. Identification of Resources

The identification of paleontological resources is needed for all parks. If no paleontological resources occur within park boundaries then no additional action is needed. If fossil resources do occur within park boundaries, then the significance of those resources must be evaluated (see Evaluating the Significance of Fossil Resources, below).

The first step in identification is to gather all relevant existing information. This can be accomplished by the actions listed below. Such work can be done by staff (if requisite paleontological knowledge is present), through a CPSU, contract, or other methods.

A. Literature Survey

Review the scientific literature for localities within park boundaries. Compile publication lists, fauna/flora lists, specimen numbers, park geographic and geologic locality data, information on deposition, taphonomy, etc. Authors of scientific papers should be contacted, as they may have unpublished information on resources.

B. Collection Surveys

Based on repositories listed in scientific publications, the park's collecting permit records, and/or with assistance from active researchers, compile a list of museums known to hold fossils from within the park. Examine these collections and their records for taxa, specimens, specimen numbers, and localities not listed in scientific literature. A sample Collection Survey Documentation form is presented in Exhibit 1.

C. Identification of Areas With High Potential for Significant Fossil Resources

Literature and collection surveys will bring together what is known about a park's paleontological resources. Such information can be used to determine sensitive areas and formations which may continue to produce significant fossil material. However, failure to find any information through literature and collection surveys is not necessarily an indication that significant paleontological resources are not present. Additional consideration must be given to what the rock formations found in the park have produced in areas outside park boundaries. This will permit a rough evaluation of the likelihood of undiscovered significant fossil resources within the park. For example, a formation which has produced abundant dinosaur footprints in areas outside a park may well contain tracks where it occurs within a park. Thus, this formation would be identified as having a potential for containing significant paleontological resources. Such an evaluation requires broad paleontological and geological knowledge and familiarity with the scientific literature, and will require input from professional paleontologists.

D. Paleontological Survey

This action is the systematic scientific survey of some or all of the rock formations and other deposits and alluvia within a park's boundaries to gather baseline data on fossil resources in the field. Such a survey requires experience with geological and paleontological field techniques in order to assure that survey results are reliable. Thus, the services of professionally trained paleontologists are required. Because of the difficulty in adequately identifying paleontological specimens in the field, samples may need to be collected for preparation and identification in the lab. Such specimens and their associated data must be catalogued into the park's museum collection.

All significant localities discovered during a paleontological survey should be documented such that there is a clear sense of the paleontological content and geological context, and that any researcher or park manager unfamiliar with the site could relocate it with little trouble. Site documentation should have two components:

1. Paleontological Locality Form

   A sample Paleontological Locality Form is presented in Exhibit 2. At a minimum, each locality record should contain the following:

   a. **locality number**

   b. **geographical locality data**--UTM, longitude-latitude, township/range/section, state, county, plotting on topographic map

   c. **geological locality data**--age, formation, member, unit

   d. **geological context**--depositional environment, lithologic description

   e. **paleontological content**--taxa present, identified to lowest possible rank (identification of specimens in the field will be tentative; if specimens are collected for further identification, such collection is noted on the form, and field identification is replaced later if warranted by preparation and study in lab)

   f. **collections and records**--field numbers of any specimens collected, park museum accession and catalog numbers pertaining to collected specimens

   g. **notes**--notation of imminent dangers, such as locality in side of ravine or area of high erosion, signs of vandalism, etc.

2. Photo Documentation

a. **Ground photos** are taken at ground level. Each site should be documented with a close-up photograph of the locality as well as a photograph of the general setting of the locality. The latter photograph should be marked to show the exact siting of the locality and bear the locality number.

b. Each locality should have its setting and number plotted on **aerial photos**. Scale of photographs should be adequate to separately plot localities which are close together either geologically or geographically.

Not every park will need to conduct all of the above listed actions in order to identify its fossil resources. These actions can be adapted to meet the specific needs of each park. Small parks with limited fossil resources whose geologic and geographic distribution is well documented may only need a literature survey or collection survey to provide additional baseline data on what material came from those sites. Large parks with little information on their resources may start with a literature survey, followed by a collection survey to determine whether a paleontological survey is needed. Parks which were established in whole or in part for their fossil resources should complete literature, collection, and paleontological surveys in order to develop a comprehensive data base on their primary resource.

III. Evaluating The Significance Of Fossil Resources

Fossils can have interpretive, exhibit, historical, or scientific significance. While the first three are relatively easy to determine, scientific significance is not. Yet once paleontological resources have been identified, their scientific significance must be evaluated in order to take appropriate management actions.

There is no single yardstick by which the scientific significance of a fossil can be measured. Some factors will often automatically make a specimen significant. Among these are specimens belonging to poorly known taxa, preservation of soft tissues or delicate structures, specimens showing pathologies or injuries, specimens of unusually large size for their species, specimens showing paleoecological relationships (such as symbiosis, parasitism, commensalism, predation), and association with datable materials (e.g. radiometric, paleomagnetic, or index fossils), to name a few.

However, many other subtle factors may make a specimen scientifically significant. While specimens of poorly known species are always significant, species which are extremely abundant may also be significant because they supply a large sample which can yield data on population structure; individual, ontogenetic, and sexual variation; ontogeny; allometry, etc. Specimens which are broken or incomplete may reveal details of internal anatomy which are not available from more complete specimens. Seemingly mundane specimens may provide important geological and geographical range extensions.

Furthermore, paleontological materials have uses beyond that of the science of paleontology. For example, species which are common and widespread may be extremely important to geologists for the correlation of sediments over large areas, and a fossil of little utility for evolutionary studies may provide a paleoecologist with critical information for understanding the depositional environment.

Thus, substantive paleontological knowledge is required in order to properly evaluate the scientific significance of fossils, and input from professionally trained paleontologists is critical for the professional management of fossil resources. The paleontological advisor should be familiar with the particular group of fossils being evaluated. Thus, active and past researchers within the park should be contacted. If no such researchers are available, superintendents should seek assistance from professional societies, such as the Society of Vertebrate Paleontology (for fossil vertebrates), the Paleontological Society (for fossil invertebrates), and the Paleobotanical Section of the American Botanical Society (for fossil plants).

Not all fossil resources within a park will be of equal significance and some may have little or no scientific significance. Professional paleontological input should be sought in developing broad groupings of fossil resources with differing significance. These can be prioritized and paleontologists and managers should work together to develop the management actions appropriate for each site.

IV. Management Actions For Fossil Resources

Once paleontological resources have been identified and their scientific significance evaluated, managers can select management actions to be taken at each site. Professional paleontologists should be consulted in determining which actions are most appropriate for any given site.

A number of factors should be considered in determining needed management actions. Some of these are:

1. Is the specimen scientifically significant? (See Evaluating The Significance Of Fossil Resources, above.)

2. Can the fossil or fossil site be used for interpretive and/or aesthetic reasons? Is there an interpretive need which requires the collection of the specimen? Will the site or area be visited during interpretive walks? Is there a hiking trail near the site or will one be built to it? Are the deposits a recognized part of the park's aesthetic values?

3. Can the specimen or site be used for exhibit needs? Is there an exhibit need which requires the collection of the specimen? Is the site to be developed as an exhibit, and if so will protective structures be needed?

4. Is the site subject to natural threats? Is the specimen in a perilous location, such as the side of a ravine or the bed of an intermittent stream? Is the specimen in an area with high erosion rates? Is the specimen subjected to large variations in temperature and humidity on a daily or seasonal basis?

5. Are there potential human threats? Are there signs of vandalism or theft within the park or in areas adjacent to the park? How easy would it be to illegally collect the specimen? Is the area remote or well patrolled? What is the market value of the specimen?

Many management actions may be undertaken at a particular fossil site. Some of these are:

1. **No action.** Appropriate for sites that have no or low significance.

2. **Monitor.** Periodic re-examination of a locality to determine if conditions have changed such that different or additional management actions are required. Photographic records should be kept so that changes can be more easily ascertained.

3. **Cyclic prospecting.** Areas of high erosion which also have high potential for producing significant specimens should be periodically examined for new sites. The periodicity of such cyclic prospecting will depend on the abundance of fossils and the rate of sediment erosion.

4. **Stabilization and reburial.** Significant specimens which cannot be immediately collected may be stabilized using the appropriate consolidants and reburied. Reburial slows down, but does not stop, the destruction of a fossil by erosion. Thus, this action is to be used only as an interim measure.

5. **Shelters.** Sites or specimens which are to be exhibited in-situ will usually require protective shelters. Structures range from small plastic domes to large buildings with attendant exhibits and research facilities. However, the use of structures may invite theft or vandalism and present problems of temperature and humidity control and specimen degradation.

6. **Excavation.** Excavation may be partial (such as the collection of a particular specimen in a fossil reef or the emergency collection of bones in imminent danger of destruction) or complete (an entire skeleton or an entire microvertebrate locality). (See below, Intensive Management.)

7. **Closure.** Closure may be temporary (such as while an excavation is in progress) or permanent (such as for areas with abundant significant fossil resources which

are easily pilfered). Closed areas may be completely withdrawn from public use or restricted to ranger led activities, such as guided hikes.

8. **Patrols.** Important sites or areas may be in the area of existing patrol routes and should be brought to the attention of patrol rangers. Other areas may require the modification of patrol routes. Patrols may be important in preventing or reducing theft and vandalism.

Many sites will require a mix of these actions for proper management. For example, an area with several highly significant localities may be closed to the public until funding is obtained for excavations. Once excavations are underway, guided walks may bring visitors to view progress. After excavations are completed, the area will be opened to the public and cyclically prospected every three years.

V. Intensive Management

The natural process of erosion is the key to the discovery of nearly all paleontological specimens. At the same time, it is also the major threat to most fossils, because once exposed at the earth's surface, fossils are rapidly destroyed by erosion. Thus, in many cases significant fossils can be protected only by intensive management, which includes collection, preparation, and placement in a museum collection for preservation and study.

See Exhibit 3 for a simplified flowchart for determining when to collect. In many cases, especially with fossil vertebrates, collecting is the only way in which significant specimens can be protected. Input from professional paleontologists should be sought when collecting is being considered. Such advice can help in estimating length of time, cost, needed supplies, etc.

Fossils can be collected in many ways, the method varying with the nature of the resource. For example, the collection of sponges from a reef complex is much different than excavating a dinosaur skeleton, and both differ from the bulk collection and processing of matrix at a microvertebrate or pollen locality.

Once collected, the spatial relationship between the fossils and the relationship of the fossils to enclosing matrix are lost. Thus, the records of an investigation are as vital as the specimens collected. Minimum requirements for field data are given above (see Paleontology Survey: Paleontological Locality Form). More documentation should accompany particularly valuable specimens or ones that require complicated excavations, including information such as preferred orientations, photographs and detailed descriptions of sediments, quarry maps, and association with other specimens. In cases where jacketed blocks are collected, records should include orientation of the jacket and the specimens within the jacket, which side is to be opened, and what the nature and extent of any consolidants or chemical wrappers may be.

Although collection will prevent the destruction of a fossil specimen, preparation in the lab is often required before the specimen is available for scientific evaluation and study. Fossil preparation is a specialized subdiscipline of paleontology and preparation should only be performed by professionals with suitable training.

Because of the wide range of preparation techniques and the ever-changing list of consolidants and preservatives used in paleontology, detailed preparation records should be kept whenever possible. Such records will be kept for vertebrate fossils. All preparation techniques and methods should be recorded and retained as part of the museum records. Refer to the NPS Museum Handbook, Part II, Chapter 3, for guidance. Such data will be invaluable to those undertaking future preparation and long-term conservation on these specimens. A sample work request/preparation card is presented in Exhibit 4.

Locality files should be maintained for all specimens collected. (See Paleontological Survey: Paleontological Locality Form).

VI. Permitting

A. General

Superintendents are responsible for the preservation and management of all resources in their parks, including paleontological resources. Superintendents may receive requests for permission to conduct various types of paleontological research in their areas. The permitting process for paleontological research projects is discussed in NPS-53, Appendix 15. The permitting system includes provisions to ensure that the collection of specimens and other research activities are in conformance with management plans and compliance requirements without a lengthy review process. Noncompliance with permit requirements can result in the suspension of research activities or revocation of the permit. Those who collect without a permit or otherwise disturb paleontological sites are subject to criminal penalties.

B. Permits Required

Upon receipt of a request for research on any paleontological resource the superintendent must determine whether or not a permit is required. Although a permit is generally required, a permit is not required under the following conditions:

1. Emergency Situations

The collection of specimens can be authorized by the superintendent when specimens are in imminent danger of damage or loss through erosion, theft, and/or vandalism. Such a threat must be of such an immediate nature that the time involved in the normal permitting process will result in the loss of the specimen.

COLLECTION SURVEY DOCUMENTATION - EXHIBIT 1

Name of Repository: _____

Date(s) Visited: _____
(Fill out a separate narrative for each visit.)

Name of NPS Investigator: _____

Persons Contacted: _____

Attached Documentation:

_____	a. Narrative Summary of Visit	( ) pages
_____	b. Detailed Lists of Examined Specimens	( ) pages
_____	c. Photography ___ prints ___ slides	( ) pages
_____	d. Copies of Field/Curatorial Notes	( ) pages
_____	e. Conservation Records	( ) pages
_____	f. Correspondence	( ) pages
_____	g. Institutional Publications	( ) pages
_____	h. Other	( ) pages

_____

a. Narrative Summary of Visit:

PALEONTOLOGICAL LOCALITY FORM - EXHIBIT 2

PARK NUMBER: _____ Locality Name: _____
TEMP NUMBER: _____
OTHER NUMBER: _____

1. TYPE OF LOCALITY: Invertebrate ____ Plant ____ Vertebrate ____ Trace ____ Other____

2. FORMATION: _____ MEMBER: _____
UNIT: _____ AGE: _____

3. LOCATION OF OUTCROP: _____

4. LITHOLOGY: _____

5. MAP REFERENCE: USGS QUAD: _____ SCALE: _____ MIN., EDITION _____
_____ of _____ of _____ of Sec. _____, T. _____, R. _____, MERIDIAN _____
COUNTY: _____ STATE: _____
UTM: _____
AIRPHOTO: _____

6. OWNERSHIP: NPS ____, BLM ____, USFS ____, BUREC ____, STATE ____, PRIVATE ____, OTHER _____

7. SPECIMENS OBSERVED: _____

8. SPECIMENS COLLECTED (continue on other side if necessary):

FIELD NUMBER	TAXON	ELEMENT	OCCURRENCE

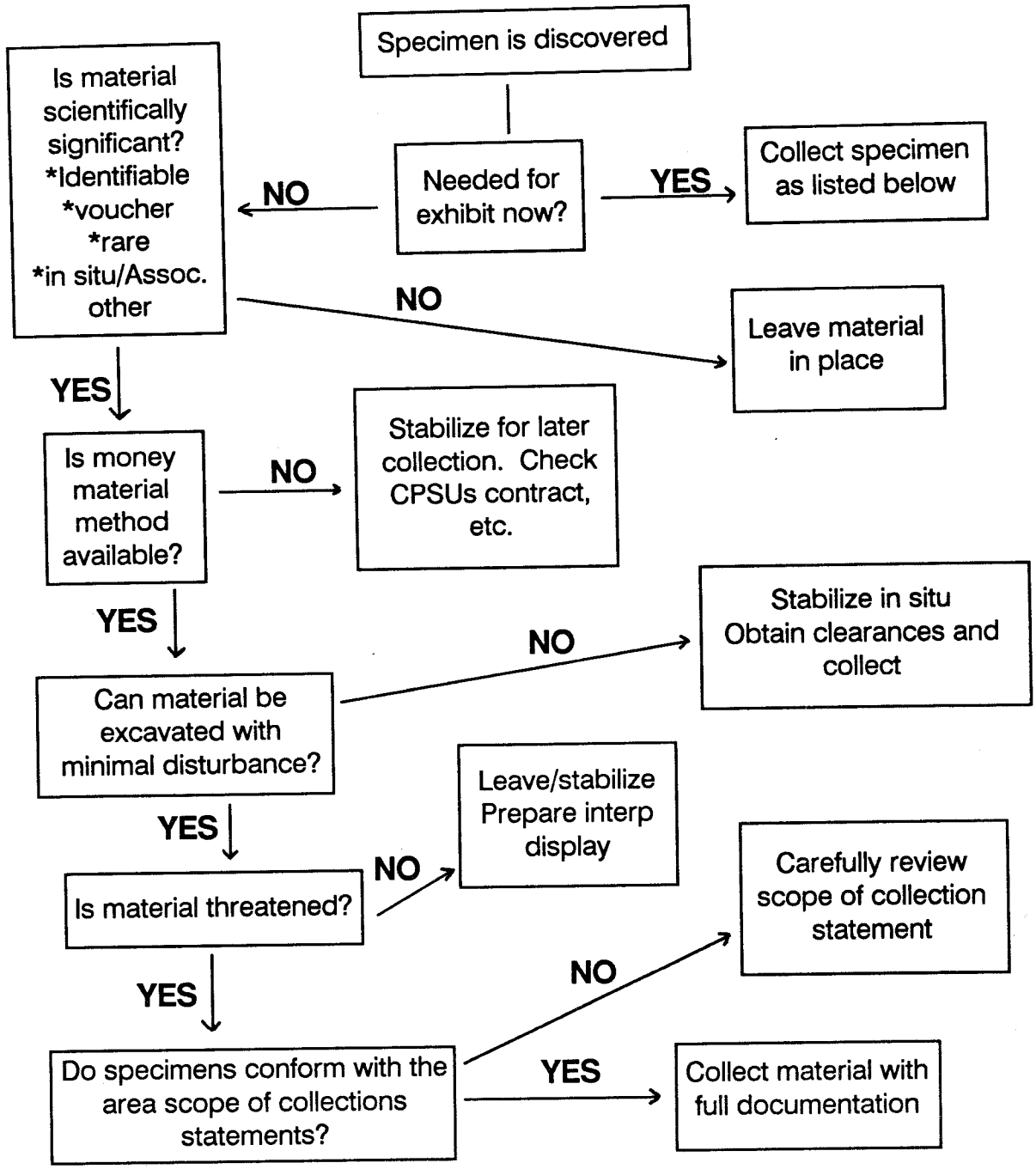
9. REPOSITORY FOR COLLECTED SPECIMENS: _____

10. PHOTOGRAPHS: _____

11. REMARKS: _____

12. RECORDED BY: _____ DATE: _____

PALEONTOLOGICAL COLLECT/LEAVE SIMPLIFIED FLOWCHART - EXHIBIT 3



PREPARATION/CONSERVATION RECORD - EXHIBIT 4

NATIONAL PARK SERVICE
Paleontological Specimens
Preparation/Conservation Record

CATALOG NUMBER ACCESSION NUMBER FIELD NUMBER

NAME:

DESCRIPTION:

1. PERMANENT LOCATION:
2. FIELD OBSERVATIONS:
3. CONDITION ON RECEIPT:
4. DEVELOPMENT NOTES:
5. CONSOLIDANTS ___B15 ___B72 ___PVA ___GLYPTAL
   Other:
6. ADHESIVES ___B15 ___PVA ___DUCO ___CYANOACRYLATE
   Other:
7. STABILIZERS & FILLERS ___plaster ___carbowax ___plastic ___mache Other:
8. CASTING / MOLDING :
9. HOURS: ___see attached timesheet ___.___ HOURS
10. COMMENTS:
11. ATTACHMENTS (photos, drawings, etc):

NAME: _____ DATE: _____

AIR RESOURCES MANAGEMENT
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AIR RESOURCES MANAGEMENT

Air is a resource in all NPS units, and many park resources and values are dependent on good air quality. Air pollution can impair visibility, injure vegetation, erode buildings and monuments, acidify water, leach nutrients from soil, and affect visitors' health and enjoyment. In order to prevent or remedy these harmful effects, the NPS will carefully manage air resources affecting NPS units. This section of the Guideline will summarize NPS responsibilities to manage the air resource, describe the activities that should be conducted to carry out these responsibilities, and explain the respective roles and responsibilities of the parks, regional offices, and the Washington Office Air Quality Division in air resource management.

DEFINITIONS

Air Quality Related Value (AQRV) A feature or property of an area whose vitality, significance, or integrity is dependent in some way upon the air environment, including visibility and scenic, cultural, biological, aquatic, and recreational resources (43 FR 15016).

Attainment area A geographic area in which the quality of the air is better than the applicable national ambient air quality standards. This classification is pollutant specific.

Class I, II, and III areas The area classification scheme established by Congress to facilitate implementation of the prevention of significant deterioration (PSD) (see definition below) of air quality provisions of the Clean Air Act.

Class I areas receive the highest degree of protection with only a small amount of certain kinds of additional air pollution allowed (see "Increments," below). **Mandatory class I areas** were designated by Congress and include international parks, national wilderness areas or national memorial parks larger than 5,000 acres, or national parks larger than 6,000 acres, which were in existence (or authorized) on August 7, 1977. These areas may not be redesignated to any other classification.

Congress initially designated all other attainment areas as **class II** and allowed a moderate increase in certain air pollutants. Congress prohibited redesignation of some class II areas to the less protective class III status. These include national monuments, national primitive areas, national preserves , national recreation areas, national wild and scenic rivers, national wildlife refuges and national lakeshores or seashores, areas exceeding 10,000 acres which were in existence (or authorized) on August 7, 1977, and national parks and wilderness areas larger than 10,000 acres established after August 7, 1977. These areas are called **class II floor areas.**

No **class III areas**--where a large amount of new air pollution would be allowed--were designated by Congress, but a process was established for redesignating class II areas to the more protective class I or the less protective class III status. Only states (or Native American

governing bodies) have authority to redesignate these areas, except as noted above. See Exhibit 1 for a list of NPS units designated as class I or class II floor areas.

Criteria pollutant A pollutant for which a national ambient air quality standard has been established (i.e., sulfur dioxide (SO_2), carbon monoxide (CO), total suspended particulates (TSP), ozone (O_3), lead (Pb), nitrogen dioxide (NO_2), and particulate matter less than 10 microns in diameter (PM-10)).

Federal Land Manager (FLM) The Secretary of the Department with authority over a piece of federal land. The Secretary of the Interior has delegated his/her authority as FLM for NPS lands to the Assistant Secretary for Fish and Wildlife and Parks.

Increments Maximum allowable increases of certain air pollutants (i.e., SO_2, TSP, NO_2, PM-10) in class I, II, and III areas. Small increases are allowed in class I areas, moderate increases are allowed in class II areas, and large increases are allowed in class III areas. These increments have been established by Congress or the Environmental Protection Agency to prevent significant deterioration (PSD) of air quality in attainment areas.

Major stationary source Any source in a fixed location that emits at least 250 tons per year of any pollutant regulated under the Clean Air Act or any source from among 28 source categories that emits at least 100 tons per year of any regulated pollutant.

National Ambient Air Quality Standard (NAAQS) National standards established by EPA under the Clean Air Act for various air pollutants to protect public health (primary NAAQS) and public welfare (secondary NAAQS). These standards are applicable nationwide and are not to be exceeded.

Nonattainment area An area where ambient concentrations of criteria pollutants exceed NAAQS. This classification is pollutant specific.

Prevention of Significant Deterioration (PSD) The program established under the Clean Air Act to regulate allowable future increases in air pollution in clean air regions of the country and for the planning and management of the allocation and use of air resources.

State Implementation Plan (SIP) A plan devised by a state (or EPA if a state fails to adopt an acceptable plan) to implement and enforce Clean Air Act requirements. Each SIP must include provisions to attain and maintain NAAQS, to prevent significant deterioration of air quality, and to protect visibility in mandatory class I areas.

POLICY AND PROGRAM OBJECTIVES

I. Policy Statement

The NPS Management Policies states:

> The National Park Service will seek to perpetuate the best possible air quality in parks because of its critical importance to visitor enjoyment, human health, scenic vistas, and the preservation of natural systems and cultural resources....The Park Service will assume an aggressive role in promoting and pursuing measures to safeguard [air quality related values] from the adverse impacts of air pollution. In cases of doubt as to the impacts of existing or potential air pollution on park resources, the Park Service will err on the side of protecting air quality and related values for future generations. (4:17)
>
> Air resources management will be integrated into NPS operations and planning, and all air pollution sources within parks will comply with all federal, state, and local air quality regulations....Management activities will include
>
> inventorying air quality related values associated with each park
>
> monitoring and documenting the condition of air quality and related values
>
> evaluating air pollution impacts and identifying causes
>
> ensuring healthful indoor air quality in NPS facilities
>
> External programs needed to remedy existing and prevent future impacts on park resources and values from man-made air pollution will be aggressively pursued by participating in the developing of federal, state, and local air pollution control plans and regulations. Permit applications for major new air pollution sources will be reviewed, and potential impacts will be assessed....The public's understanding of park air quality issues will be promoted through educational and interpretive programs. (4:18)

II. Program Objectives

The goal of the NPS air resource management program is the preservation, protection, and enhancement of air quality and air quality related values of units of the National Park System by ensuring compliance with the requirements of the Clean Air Act and the NPS Organic Act. The major objectives include: (1) ensuring that facilities and activities within parks are in compliance with Clean Air Act requirements, including state and local regulations; (2) acquiring information and tools needed to document air quality conditions in parks, evaluate trends, identify resources that may be or are affected by air pollutants, determine cause and effect relationships, and estimate changes that might result from increasing or decreasing pollution levels; and (3) using available

information to remedy existing and prevent future air pollution effects on park resources and values, including participating in federal and state regulatory development and stationary source permitting processes, as required by the Clean Air Act.

AUTHORITIES

I. General Authorities for Air Resource Management

The NPS's air resource management-related responsibility is grounded in several acts of Congress. See the discussion of general authorities in Chapter 1. Other laws provide a variety of opportunities for aggressive NPS action to manage the air resource and protect park resources and values that are dependent upon good air quality. These include the National Environmental Policy Act, the Wilderness Act, the Endangered Species Act, and the Surface Mining Control and Reclamation Act. The enabling legislation or the accompanying legislative histories for numerous individual parks also indicate Congress' clear intention of protecting resources and values that might be sensitive to air pollution (e.g., superlative scenic features that depend on good visibility). In addition to these general grants of authority, Congress made more explicit the NPS's authority and duty to protect park resources from air pollution-related damage in the Clean Air Act Amendments of 1977.

II. Clean Air Act

A. Purposes of the Act

The main purpose of the Clean Air Act is to protect and enhance the nation's air quality to promote the public health and welfare. The Act establishes specific programs that provide special protection for air resources and AQRVs associated with NPS units. For example, sections 160-169 of the Act establish a program to prevent significant deterioration of air quality (PSD) in clean air regions of the country. The purposes of the PSD program are to protect resources that might be sensitive to pollutant concentrations lower than the NAAQS and "to preserve, protect and enhance the air quality in national parks, national monuments, national seashores, and other areas of special national or regional natural, recreational, scenic or historic value." In section 169A of the Act, Congress also established a national goal of remedying any existing and preventing any future manmade visibility impairment in mandatory class I areas.

B. Air Quality Control Plans

The EPA has responsibility for publishing national standards and regulations to guide the development of air quality control programs, consistent with various requirements in the Act. State and local governments have the primary responsibility for the development, implementation, and enforcement of air pollution prevention and control plans. If states fail to adopt State Implementation Plans (SIPs) consistent with EPA regulatory requirements, EPA must promulgate a federal air quality control implementation plan. SIPs contain a wide variety of measures to achieve clean air

goals. One of the major required elements of any SIP is a requirement for a pre-construction review of air quality impacts from major new or expanding stationary sources of air pollution.

C. NPS Role in Air Quality Planning

The Clean Air Act generally requires states to consult with the Federal Land Manager (FLM) when developing and revising SIPs that might affect any federal lands, regardless of the classification of the area. Congress specifically required FLM involvement in the development of PSD and visibility protection SIPs. Like any party, the NPS also has an opportunity to participate in the required pre-construction review of major new or expanding air pollution sources and to express concerns or suggest mitigation measures to reduce or eliminate impacts on park air resources.

The Clean Air Act provides the highest degree of protection for class I areas. Congress gave FLMs and superintendents an affirmative responsibility to protect air quality related values of class I areas. In order to carry out this responsibility, Congress further directed that the FLM must be involved in the permitting process which takes place before a major stationary source of air pollution is constructed, if the emissions from the source are likely to affect a class I area. The FLM is required to consider, in consultation with the permitting authority, whether the source will have an adverse impact on AQRVs of the class I area. If pollution emitted by the source is predicted to cause or contribute to an exceedance of the allowable pollution increments for class I areas, then the permitting authority may not issue a construction permit unless the FLM certifies that there will be no adverse impact on AQRVs. Even in cases where allowable increments are not exceeded, the FLM should carefully analyze impacts on AQRVs. If the FLM can demonstrate to the permitting authority's satisfaction that AQRVs may be adversely affected, even though increments would not be exceeded, no permit will be issued.

D. NPS Role in Visibility Protection

The visibility protection provisions of the Clean Air Act and EPA's implementing regulations give the NPS FLM a key role in protecting visual air quality in mandatory class I areas. First, the FLMs were required to identify mandatory class I areas where visibility was an important value. In response to this requirement, the FLM for the NPS notified EPA that visibility is an important value in all 48 class I areas managed by the NPS. Secondly, the FLM was given an opportunity to identify scenic vistas associated with class I areas that are important to the visitor's enjoyment even though the views extend beyond park boundaries. The FLM published a proposed regulation listing numerous such views, but later decided visibility in these views could be adequately protected without a formal regulation.

The FLM is also charged with notifying states (or EPA, if the affected state has not adopted a visibility protection SIP) if there is existing visibility impairment in any class I area and identifying the suspected source(s) of the impairment, if possible. This notification of "existing impairment," which can be made at any time, triggers certain additional requirements. First, the state (or EPA)

must determine if the impairment is reasonably attributable to a specific source or small group of sources. Monitoring or modeling can be used to assess whether the source(s) causes or contributes to significant visibility impairment. If it is determined that the source at least contributes to visibility impairment, then the state (or EPA) must assess whether further emission reductions at the source would perceptibly improve visibility. If a perceptible change would result, than the state (or EPA) must determine the best available retrofit technology (BART).

The BART analysis includes consideration of available technology, costs of compliance, energy and non-air-quality impacts of compliance, other pollution control equipment in use, the remaining useful life of the source, and the degree of improvement likely to result. Once the state (or EPA) establishes BART through this cost-effectiveness analysis, the source owner or operator may apply to the EPA Administrator for an exemption from BART. Public notice and comment on the exemption request is required. If EPA decides to grant an exemption, it will only be effective upon concurrence by the FLM.

In cases where existing visibility impairment in a class I area cannot be reasonably attributed to a specific source or small group of sources, the NPS will encourage states (or EPA) to develop more comprehensive, long-term strategies to minimize regional visibility impacts.

See 40 CFR 51.300 et seq. for detailed regulatory requirements related to visibility protection.

E. NPS Compliance Responsibilities

The Act also places constraints on any development or management activities within parks which could affect air quality by requiring parks to comply with all federal, state, and local air pollution control laws and regulations (Section 118). For example, all parks, including those with exclusive jurisdiction, must obtain any necessary air quality permits before constructing facilities or engaging in activities (such as prescribed fires) that might emit air pollutants.

RELATIONSHIP TO OTHER GUIDANCE

See also Air Resource Management Manual, published by the Washington Office Air Quality Division, and NPS-18, the Fire Management guideline. In this Guideline, see Chapter 4, Environmental Compliance.

PROGRAM GUIDANCE

I. Basic Air Resource Management Questions

In approaching air pollution problems, several basic questions provide a useful investigative method for analyzing and understanding such problems and their potential consequences for park resources. These basic questions relate to the types of air pollutants of greatest concern, the sources of these pollutants, and their potential effects on park resources. To the extent that park or regional staff

are able to anticipate and/or begin to gather the data necessary for responding to these questions, the process of defining the problem and determining appropriate action can be facilitated.

1. Which resources, if any, are known to be, or potentially may be, affected by the pollutant? What are those effects?

2. What are the current and/or projected levels of the pollutant in the ambient air?

3. Are the measured or projected pollutant levels high enough to cause effects?

4. How will the pollutant affect the protected resources, the ecosystem, or visitor enjoyment?

5. What is/are the source(s) of the pollutant?

6. What can be done to control/mitigate the pollutant's emissions and effects (including legal and regulatory options)?

These basic questions are explained in much greater detail in the Air Resource Management Manual published in 1984 by the Washington Office Air Quality Division. What follows is a general discussion of major NPS air quality related activities which help provide answers to these basic questions. The activities include internal programs, such as monitoring (criteria pollutants, visibility, and biological effects), modeling, park operations and planning, and interpretation; and external (interagency) programs, such as resource management planning, review of industrial development plans and air pollution permit applications, legislative and regulatory development, participation in the SIP process, and park redesignation. The roles and responsibilities of the Washington Office Air Quality Division (AQD), regional offices, and individual parks, are briefly discussed and described under Roles and Responsibilities, below.

II. Internal NPS Activities

Internal air resource management activities are those in which NPS personnel are the primary participants and the activities are primarily confined to parks. Field staff have initial responsibility for identifying a need for such activities, although Servicewide initiatives and Congressional mandates are also likely to affect the nature, extent, and duration of activities undertaken in some parks. Regional offices establish priorities on a regionwide basis, and the AQD has responsibility for maintaining an effective and efficient Servicewide air quality program and otherwise ensuring compliance with statutory and regulatory requirements.

A. Inventory and Monitoring of Air Quality Related Values

Air quality and related values are monitored in NPS units for several reasons. The primary objectives of monitoring are to:

1. establish existing or baseline concentrations in NPS units,
2. assess trends in air quality in NPS units,
3. judge compliance with national air quality standards,
4. assist in the development and revision of national and regional air pollution control policies which might affect parks,
5. provide data for atmospheric model development and evaluation,
6. correlate existing effects on park resources with existing air quality levels, and
7. provide meaningful input when commenting on proposed new sources of air pollution.

Some of these objectives are satisfied by long-term monitoring at selected NPS sites nationwide; others may require that park-specific data be collected. The Servicewide Air Quality Monitoring Strategy (AQD, 1990) discusses what kinds of monitoring are appropriate to meet park, regional, and Servicewide needs. This section of the Guideline provides a general summary of monitoring objectives, requirements, and data uses.

In addition to monitoring specific pollutants in the air, meteorological monitoring is often conducted, because it can help explain monitored concentrations. The following meteorological parameters are typically measured at these stations: wind speed and direction, temperature, dew point, solar radiation, and precipitation.

1. Ambient Air Quality Monitoring: Criteria Pollutants

Two gaseous criteria pollutants, ozone and sulfur dioxide, are particularly toxic to native plant species found in NPS units. These pollutants are known to be harmful to vegetation even at levels below the NAAQS established by the Environmental Protection Agency. Ozone (which forms when volatile organic compounds and nitrogen oxides interact in the presence of sunlight) can be transported long distances in the atmosphere and thus is often an areawide problem. Because of high ozone levels in most urban areas throughout the nation, ozone levels in many NPS units are also high enough to adversely affect human health. Sulfur dioxide is more likely to be a localized problem (within 100 km of the pollution source), affecting individual parks.

The EPA has established reference and equivalent methods for the measurement of air pollutants for which NAAQS have been established. (See 40 CFR 53 and 58.) The EPA requires the use of this methodology by federal, state, and local agencies wishing to use the measurement data for regulatory purposes, such as determining the attainment status of an area with respect to these standards. Because the NPS is involved in numerous regulatory arenas at the state and national level requiring the use of measurement data comparable to those collected by state and federal agencies, the NPS relies on the sampling methodology specified by the EPA. Any criteria pollutant monitoring conducted in NPS units must conform to EPA requirements.

In order to ensure compliance with EPA requirements, including quality assurance and quality control requirements, the Washington Office AQD has responsibility for coordination and supervision of the NPS gaseous pollutant monitoring network. Site field operations are carried out in one of four ways. Generally, NPS park personnel are trained to operate and maintain the monitoring equipment, perform routine quality control checks, and calibrate the instruments. The NPS can also enter into cooperative agreements with state or local agencies to obtain some level of support ranging from total operation to assistance to NPS site operators. Where it is not possible to obtain site operations support from either the park, state, or local agencies, NPS monitoring support contractors will assume this responsibility by hiring and training a local person to function in this capacity. Finally, some sites located in NPS units are funded and operated by the respective state or local agencies.

The collection of scientific data requires that procedures be developed to ensure that the data are sound and defensible. The AQD adheres to this philosophy and takes the necessary steps to ensure that the data are valid and comparable to those collected by other federal, state, and local air pollution control agencies. The AQD has implemented a quality assurance program that meets EPA requirements, including written standard operating procedures for equipment and site operations, a Servicewide training program, and a schedule of external quality assurance performance and system audits. A minimum of one performance and system audit is conducted at each site to supplement any audits currently being performed by state and local agencies.

2. Visibility Monitoring

Scenic resources are extremely sensitive to air pollution. Even a very small amount of fine particulate matter (less than 2.5 microns in diameter or one tenth the diameter of a human hair) in the air can affect the ability to perceive colors, contrast, texture, and form of features, landmarks, and panoramas. Visual air quality is very important to park visitors. Specific vistas are often mentioned in legislation or Congressional reports concerning the establishment of an NPS unit. Visibility in mandatory class I areas is also specifically protected by the Clean Air Act, and the NPS is required to be involved in decisions made by other agencies if visibility in a class I area might be affected. Therefore, the NPS conducts visibility monitoring and research to provide managers with the tools, methods, and data needed to manage and protect visibility in the parks.

Visibility monitoring provides information about current visibility conditions at the parks, and, over time, can be used to assess trends. When view monitoring (using cameras) is combined with aerosol monitoring (using fine particle samplers), information about the composition of the particles in the air associated with visibility impairment can be obtained. This information can be used to determine how much of the observed visibility impairment is manmade, and what types of sources emit the identified particles. Analysis of the monitoring data and research on the transport and transformation of pollutants in the air help to identify the urban and industrial areas that cause or contribute to manmade visibility impairment.

Visibility monitoring is conducted primarily in class I areas, but should also be considered in response to a particular visibility problem, or if visual air quality is an especially important value at a park, or if the park is situated along an important pollution transport pathway. The AQD has Servicewide responsibility for the NPS visibility monitoring and research program, including data analyses and reporting on a routine basis. The AQD should be consulted to determine whether and how visibility should be monitored in a specific park. Regional offices help set priorities for visibility monitoring and special project requests submitted by parks. Park staff provide substantial assistance in operating and maintaining visibility monitoring equipment.

The EPA has not yet established reference methods for visibility monitoring, but the NPS is currently cooperating with the EPA and other federal land managers to develop and test such methods through the IMPROVE (Interagency Monitoring of Protected Visual Environments) program. Many NPS-managed class I areas are part of the IMPROVE network, which was established to meet regulatory needs and is managed by a committee composed of the EPA, NPS, and other federal land managers.

3. Biological Effects Monitoring

Air pollution also affects biological resources. Vegetation is generally more sensitive to air pollution than animals and will usually show the first biologically detectable effects of air pollutants. Therefore, biomonitoring and related research activities should focus on air pollution effects on native plant species and be designed to:

1. determine the sensitivity of native plants to different air pollutants,

2. identify air pollution impacts on sensitive plants, and

3. establish baseline conditions of plants and monitor trends in NPS ecosystems.

Biological effects studies are used to examine the effects of air pollution on a wide range of plant species in the parks, with emphasis on class I areas and areas where pollution effects are suspected because of proximity of air pollution sources, observed visible injury, or presence of known sensitive species. Some studies may be done in the field, others in controlled laboratory situations. Biomonitoring studies, in particular, may be designed in such a way as to provide information on

a variety of natural and manmade effects on native vegetation. These studies may involve taking samples of plant material for chemical analysis or surveying for foliar injury or ecological damage in one or more plots selected throughout a park.

Biomonitoring studies are used to detect the first sign of air pollution effects on biological resources in an area. Such studies should use species that are native to the area and known to be sensitive to air pollution. If a non-native species is used, conditions should be carefully controlled to ensure that the species (or genotype) is not introduced into the park. The sensitive species used in biomonitoring are called biomonitors or bioindicators, and include bioaccumulators. The AQD can provide technical assistance in identifying appropriate biomonitors in most NPS units. Inventories can be used to compile information on biological resources that may be sensitive to air pollutants to help determine whether increased air pollution emissions near an NPS area might endanger biological resources in the park. These studies compile information about the presence and geographical extent of plant species in the parks, including vascular and nonvascular plants.

In order to help determine the relationship between air pollution and various biological effects, individual plants of a species can be exposed (in the laboratory or the field) to carefully controlled amounts of one or more air pollutants at varied frequencies of exposure. These studies are coordinated by the AQD, in response to field requests or Servicewide needs. Species most likely to be selected for fumigation include species sensitive to air quality, the most common species in NPS units, dominant species, or rare and endangered species. (See Chapter 2, Freshwater Resources Management, E. Impacts on Aquatic Habitats, for a discussion of effects of atmospheric deposition on aquatic organisms and Endangered, Threatened, and Rare Species for a discussion of permits required.)

B. Air Quality Modeling

An air quality model is the mathematical representation (or "model") of the physical and chemical processes by which air pollutants are emitted into, dispersed, transformed, and deposited out of the atmosphere. It attempts to approximate the mixing and progressive dilution of pollutants through the atmosphere in order to predict the effect that a source or sources of pollution will have on air quality levels at particular ground points called "receptors." Air quality modeling is relied on in situations where air pollution monitoring data are not available, such as new source permit applications, or when existing air pollution is suspected as a cause of resource (AQRV) damage in a park with no air monitoring.

The EPA has published a guideline on air quality models to foster consistency in model applications and to improve modeling procedures. These models can be used to assess impacts from air pollution sources within parks or in close proximity to parks (50 km). In order to comply with NPS air resource management responsibilities, more sophisticated models should be developed to address meteorology and pollutant deposition in complex terrain, as well as transport of pollution into parks from urban and industrial areas hundreds of kilometers away. Therefore, the NPS, through the

AQD engages in extensive research activities for the purpose of improving modeling techniques to address these situations.

C. Incorporating Air Quality Management into Park Planning

1. Air Quality Compliance Requirements

When the sources of air pollutants are within the parks themselves, the NPS should make resource management decisions balancing the need for the activities emitting pollutants and the need to protect park resources from the pollutants. In any event, all air pollution sources within parks (even those with exclusive jurisdiction) must comply with all federal, state, and local laws and regulations. Facilities and activities that might be affected by this compliance requirement include prescribed fires, heating plants, industrial boilers, incinerators, asphalt batch plants, earth moving or disturbance activities (e.g., construction or demolition of roads or structures), and wood/coal-burning stoves.

Parks must always consult with their regional air quality coordinator or the AQD prior to engaging in any activity or commencing construction of any facility that might emit air pollutants, including smoke, to determine compliance requirements. These requirements may vary depending on the location and nature of the activity, and the size and type of facility. The AQD can assist in the design of facilities and the selection of fuels which will assure the maintenance of good air quality in parks. Civil penalties (up to $10,000 per day or infraction) may be levied by federal, state, or local air pollution control authorities for violations of air quality control regulations.

2. NPS Internal Planning

The park planning process provides excellent opportunities for NPS personnel to identify and carry out air resource management responsibilities. It is important to include air resource management objectives and projects in NPS planning documents to ensure that projects to protect the park resources and enhance visitor enjoyment are funded and implemented. Documenting air quality objectives and issues in park management plans also provides a useful record of management concerns for use in external decision arenas. Park staff, in consultation with regional air quality coordinators, are normally responsible for ensuring that air resource management is adequately addressed in NPS planning documents. Park staff also have an important role in implementing the air resource management projects.

The statement for management should identify issues, problems, and management objectives related to air quality and AQRVs. Air resource management objectives could be addressed in several sections, including inventory and analysis of influences, land uses and trends, major issues, and management objectives. Air quality discussions should also be incorporated into the resources management section of the general management plan, which establishes actions to monitor, inventory, study, restore, interpret, and perpetuate a park's natural and cultural resources.

Air resource management issues should be addressed in detail in the resource management plan. The RMP contains strategies designed to resolve issues and problems related to a park's resources as well as research programs needed to more accurately define crucial aspects of those problems. Air quality related issues may be integrated into one project statement, or various aspects of monitoring and research may be discussed in several project statements. The project statement(s) should include references to legislative authorities and mandates, air quality designation (whether the area is class I or II, and the attainment status for each criteria pollutant), detailed descriptions of air quality conditions and issues and how they may affect park resources and visitors, alternative actions, and the recommended actions.

Class I areas and other parks with critical or sensitive AQRVs should consider developing comprehensive air resource management "action plans." In addition to describing past, ongoing, and proposed air quality monitoring and research projects, this plan would also explain how information about park air resources will be used, internally and externally, and what actions will be taken to remedy existing problems and prevent future ones. Management objectives could also be more specific and explicitly stated if sufficient data are available, including, perhaps, establishing park-specific ambient air quality standards or visibility protection standards. When developing comprehensive action plans, parks should work closely with the appropriate regional air quality coordinator and technical experts in the AQD.

3. Air Quality Project Funding

Funding requests to accomplish objectives discussed in the park planning documents, particularly those included in RMP air quality project statements, should be submitted on forms 10-238 (development/study package proposal) or 10-237 (proposed base funding increase). These forms are required for each project requiring funding, and provide details of and justifications for the project. Instructions for completing these forms are found in NPS-71, the draft Budget and Programming guideline. Funding for air quality projects may be obtained from a variety of sources, primarily within the NPS. These funding sources include the park base, the regional base, fee revenues, the Natural Resources Preservation Program, the Servicewide Air Quality account, the Fire Program, the Acid Precipitation Program, and the Cultural Resources Preservation Program. The AQD manages the Servicewide Air Quality account, which is allocated annually to the highest priority projects as jointly determined by the Regional Directors and the Associate Director, Natural Resources. Priority-setting normally occurs on an annual basis, but is based on multi-year project request files. See further, Chapter 5, Natural Resources Budget Formulation.

D. Interpretive Activities

It is important for the public to understand how air pollution affects park resources, since the public plays a key role in bringing about those actions needed to remedy existing air pollution problems and prevent future ones. Interpretive activities provide excellent vehicles for explaining air quality conditions and concerns, NPS responsibilities to protect park air resources, and air

resource management activities, including research and monitoring programs, as well as participation in regulatory matters.

Park staff are responsible for preparing those elements of interpretive programs which address the air resource. The AQD can provide park-specific or Servicewide information for use in developing interpretive media. All air quality related interpretive materials, programs, or exhibits developed by parks must be reviewed by the regional air quality coordinator, in conjunction with the Regional Branch of Interpretation or AQD prior to publication or presentation in order to ensure technical accuracy and policy consistency.

In parks that conduct visibility monitoring, wayside exhibits at scenic overlooks are particularly effective in explaining visibility conditions and concerns. In addition, exhibits on native vegetation can incorporate information about air pollution effects on sensitive vegetation. Site bulletins can be developed to provide more detailed information on specific issues. Interpretive talks, including slide presentations or field trips to monitoring stations, are another way of imparting air quality information.

III. External (Interagency) Cooperation

A. Overview

In most cases, the air pollution affecting park resources and values comes from outside the parks. Information from the air quality monitoring and research program is used to support NPS participation in external decision-making arenas. NPS concerns and recommendations regarding proposed or existing air pollution sources are directed to the governmental agency that has authority to regulate existing air pollution sources and to permit construction of new sources. Cooperation is also elicited from industry to ensure protection of NPS resources. The Clean Air Act requires that the NPS be involved in reviewing state implementation plans, particularly those plan elements related to prevention of significant deterioration of air quality in clean air areas and to protect visibility in class I areas. The NPS is also required to evaluate the effects that a new air pollution source might have on nearby park resources. The AQD has Servicewide responsibility for ensuring compliance with these Clean Air Act requirements, in coordination with NPS regional offices and parks.

B. Reviewing Impacts of New Air Pollution Sources

1. Resource Management Planning

Other federal agencies engage in resource management planning activities similar to the NPS process. For example, the U.S. Forest Service and the Bureau of Land Management each have planning programs for integrating resource development and resource protection activities within their jurisdictions. To the extent that NPS lands are near lands managed by other federal agencies, these resource management planning programs may have direct or indirect impacts on air quality

or AQRVs. Park staff have responsibility initially for identifying opportunities to work cooperatively with other land managers to ensure that potential conflicts are anticipated, avoided, and resolved. This requires early involvement (e.g., at the scoping stage) in other agencies' planning processes, including the assessment of potential environmental impacts.

Parks should consult with regional air quality coordinators to determine whether another agency's development plans might adversely affect air quality and AQRVs. If highly technical expertise is required to communicate concerns and recommendations to another agency (e.g., modeling of air quality or visibility impacts is needed), then the AQD should be consulted as well. The AQD may also review draft environmental impact statements at the request of the Washington Office Environmental Quality Division or on its own initiative if major energy or industrial development is planned that could affect park air resources. In such cases, the AQD review is coordinated with the regional air quality coordinator or regional environmental compliance officer.

2. Review of Permit Applications for New Air Pollution Sources

If an industrial or energy resource developer wishes to construct or modify a major stationary source of air pollution, the developer must first obtain a permit to emit air pollutants. Usually the permitting authority is a state or local agency, but permits may also be issued by the EPA. The permitting authority must notify the public of permit applications for major stationary sources, and a public comment period must be provided. This process gives the NPS an opportunity to be involved in any decision to permit increased air pollution near any NPS unit--regardless of the area's classification.

If the permit applicant proposes to locate the air pollution source near a class I area, the permitting authority must notify the federal land manager (FLM) and provide the FLM a reasonable opportunity to comment on whether the proposed source would adversely impact AQRVs of the class I area, as required by section 165 of the Clean Air Act. The FLM for the NPS is the Assistant Secretary for Fish and Wildlife and Parks, and the AQD serves as technical staff to the FLM in carrying out this responsibility. If permit applications for sources affecting class I areas are received by a park or regional office, a copy must immediately be sent to the AQD Denver field unit. The AQD reviews the permit application, assesses potential impacts, prepares technical comments, and recommends policy positions to the affected Regional Director and superintendent, through the regional air quality coordinator. The AQD generally prepares NPS comments for the Regional Director's signature.

In controversial cases or other cases where technical review suggests that class I area AQRVs might be adversely affected, concurrence from the FLM must be obtained before NPS comments are transmitted to the permitting authority. In addition, if class I increments are expected to be exceeded and technical review shows that no adverse impact on AQRVs is likely to result, the permit applicant will need to obtain a certification to that effect from the FLM before a permit can be issued by the permitting authority. Only the FLM can issue such a certification. The procedures for doing so are set forth in 47 FR 30226.

When determining whether the changes caused by air pollutants constitute an adverse impact on air quality related values, the NPS primarily looks at whether the national significance of the area would be diminished, whether the structure and functioning of ecosystems would be impaired, or whether the quality of the visitor experience would be impaired. The frequency, magnitude, duration, location, and reversibility of the potential impact are also taken into account.

C. Legislative and Regulatory Development

In order to carry out its air resource management responsibilities, the NPS participates in the development of air quality related legislation and regulations, at both the federal and state level, to promote establishment and implementation of air pollution control programs that consider and address existing and potential air pollution impacts on park resources and values. Because of the Servicewide effect of federal legislative and regulatory programs, the AQD has the primary responsibility for monitoring air quality related legislative and regulatory proposals and preparing comments or testimony on behalf of the NPS. The AQD ensures that any necessary NPS or Departmental clearances are obtained prior to external release or publication of NPS comments.

1. Incorporation of Park Air Resource Protection Goals in State Implementation Plans

States are required to develop SIPs detailing how they plan to protect air quality. These plans must include strategies needed to attain NAAQS, to prevent significant deterioration of air quality in clean air areas, and to make reasonable progress toward the national visibility goal. Using information and analytical tools developed through the NPS air quality research and monitoring program, the AQD has primary responsibility for working cooperatively with states to develop plans consistent with federal requirements and park protection goals. The AQD encourages and supports regional and park staff involvement in this planning process. The AQD has responsibility ultimately, however, for preparing NPS comments on SIP proposals for the appropriate Regional Director's signature, after obtaining any necessary concurrences from the FLM. FLM concurrence on most SIP-related NPS comments is required.

D. Redesignation

States and Indian tribes are given authority under the Clean Air Act to redesignate clean air areas to provide greater or lesser protection from air pollution degradation. The NPS encourages and supports redesignation actions which will provide added air quality protection under the law wherever necessary and feasible, and, conversely, to intervene in proposed redesignation which would allow greater air quality degradation.

Prior to a redesignation, a state must conduct an analysis which addresses the health, environmental, economic, social, and energy effects of the proposed redesignation. Public hearings must be held in the area prior to the redesignation. If federal lands are being considered, the FLM must have an opportunity to comment.

The Clean Air Act required the FLMs to review all national monuments, primitive areas, and preserves and to recommend those areas for possible redesignation where air quality related values were important attributes. The NPS conducted its review and published a list of those areas in the Federal Register on June 25, 1980.

There are various ways in which the NPS can become involved in the redesignation process, including:

1. working with states which are contemplating redesignation actions and assisting in preparation of relevant sections of the required analysis;

2. working with appropriate state officials to help assure that redesignation procedures provide for adequate consultation with NPS officials as to the effects of the proposal on park air quality and AQRVs; and

3. becoming actively involved in public review of redesignation issues at the national, state, and local levels, including presenting NPS views in writing, attending meetings, participating in public hearings, and assisting local/state government officials in their assessment of redesignation issues.

Official NPS recommendations related to redesignation actions require concurrence from the FLM.

ROLES AND RESPONSIBILITIES

I. Park

Superintendents play a critical role in planning and carrying out air resource management activities, particularly with respect to monitoring air quality conditions and identifying resource threats. The superintendent's responsibilities include:

1. identifying all air quality related values and resource threats related to air quality in the resource management plan(s), including developing management objectives, project statements, and funding requests;

2. submitting for review to the regional office and the AQD any air quality permit applications received from permit applicants or federal, state, or local air quality agencies;

3. being aware of and complying with all federal, state, and local air quality regulations that affect park operations and facilities;

4. ensuring diligent participation by park staff in air quality data acquisition activities, including operation and maintenance of monitoring equipment;

5. in consultation with the AQD, issuing health warnings or alerts to visitors when pollution levels within the park are observed or expected to exceed levels hazardous to human health, and notifying the regional safety officer of this action;

6. being aware of proposed industrial or energy resource development activities that may influence the park's air quality, including participating in scoping processes for such projects and requesting technical and policy assistance from the regional office or AQD, when necessary;

7. participating in public hearings and meetings where issues relevant to protection of air quality in the parks is the issue;

8. cooperating with other federal, state, or local agencies or research/academic institutions in air quality monitoring or research which may contribute to the Service's goal to perpetuate the best possible air quality in parks by providing information needed for decision-making that affects air quality in parks; and

9. ensuring that interpretive materials and media developed by park staff related to air resource management has been reviewed by NPS technical and policy experts.

II. Region

Regional offices coordinate air quality related matters between the parks and the AQD. Each regional office designates a **regional air quality coordinator (AQC)** who is generally responsible for this coordination function. The AQC also keeps regional management apprised of significant air quality issues affecting parks in the region. AQC responsibilities include:

1. providing technical and policy assistance on routine air quality matters to parks and regional management, and ensuring that the AQD is consulted on nonroutine, controversial, or other matters requiring a high level of technical or policy expertise;

2. reviewing park management plans to ensure their adequacy and accuracy in the area of air resource management (including interpretation) and monitoring;

3. seeking to obtain the necessary research or monitoring for parks where air pollution is a threat to park resources and values, including soliciting air quality related project requests from parks, ranking such projects on a regional basis, and participating in allocation of the Servicewide air quality project account;

4. in consultation with the regional chief scientist, reviewing and approving all research programs initiated in regional park units;

5. coordinating park and regional office concurrence on comments/testimony prepared by the AQD on air pollution permit applications and SIPs, including ensuring the timely submittal of those comments to the permitting/regulatory authority; and

6. disseminating air quality data and reports published by the AQD to parks.

III. Washington Office

Procedurally, the Departmental Manual delegates the authority granted to the Secretary under the Clean Air Act as "Federal Land Manager" to the **Assistant Secretary for Fish and Wildlife and Parks.**

The Assistant Secretary has stated that his/her office will exercise this authority and will handle all matters related to EPA visibility regulations, with the NPS offices providing staff support. In addition, the functions of the "federal official charged with direct responsibility for management of such lands" under Section 165(d)(2) of the Act (new source review provisions) are subject to general policy guidance from the Assistant Secretary's office and to specific review in controversial cases. The AQD can provide guidance in determining when the Assistant Secretary's review is necessary and provide assistance in obtaining the clearance when required.

The **Air Quality Division (AQD)** has primary responsibility for the NPS air resource management program, including ensuring compliance with Clean Air Act requirements. The major functions of the AQD are:

1. to provide support to the Director, the FLM, and the Secretary of the Interior. This involves such activities as: (1) developing testimony for Congressional hearings on air quality issues which may affect parks; (2) preparing information for use in work with other bureaus, agencies, and departments on policies, regulations, or activities with potential air quality impacts on parks; (3) reviewing, analyzing, and developing policy positions on proposed federal, state, and local regulations, legislation, or management activities that may impact park resources; and (4) reviewing all air quality permit applications for major new and modified industrial facilities whose activities may affect AQRVs in parks.

2. to provide policy and technical information and assistance to the parks and regions. The AQD provides air resource planning and management guidance and support (including project funding) to parks and regions. The AQD's technical staff assists park and regional personnel in their efforts to identify, document, prevent, mitigate, remedy, and interpret damage to park resources from air pollution. In addition, AQD personnel are available to work on specific air resource projects.

3. to plan, design, and implement air quality related research and monitoring. The AQD designs and directs air quality related research and monitoring for the purposes of (1) documenting air quality and AQRV conditions in NPS units; (2) accurately describing the causes and effects of park air pollution problems, and (3) seeking solutions to current problems resulting from air pollution in the parks. The AQD coordinates the collection, analysis, and reporting of monitoring data for criteria air pollutants and visibility.

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AIR QUALITY DESIGNATION - EXHIBIT 1

NPS Areas Designated as Class I

1. Acadia National Park, Maine
2. Arches National Park, Utah
3. Badlands National Park, South Dakota (wilderness portion)
4. Bandelier National Monument, New Mexico (wilderness portion)
5. Big Bend National Park, Texas
6. Black Canyon of the Gunnison National Monument, Colorado (wilderness portion)
7. Bryce Canyon National Park, Utah
8. Canyonlands National Park, Utah
9. Capitol Reef National Park, Utah
10. Carlsbad Caverns National Park, New Mexico
11. Chiricahua National Monument, Arizona (wilderness portion)
12. Crater Lake National Park, Oregon
13. Craters of the Moon National Monument, Idaho (wilderness portion)
14. Denali National Park, Alaska
15. Everglades National Park, Florida
16. Glacier National Park, Montana
17. Grand Canyon National Park, Arizona
18. Grand Teton National Park, Wyoming
19. Great Sand Dunes National Monument, Colorado (wilderness portion)
20. Great Smoky Mountains National Park, North Carolina, Tennessee
21. Guadalupe Mountains National Park, Texas
22. Haleakala National Park, Hawaii
23. Hawaii Volcanoes National Park, Hawaii
24. Isle Royale National Park, Michigan
25. Joshua Tree National Monument, California (wilderness portion)
26. Kings Canyon National Park, California
27. Lassen Volcanic National Park, California
28. Lava Beds National Monument, California (wilderness portion)
29. Mammoth Cave National Park, Kentucky
30. Mesa Verde National Park, Colorado
31. Mount Rainier National Park, Washington
32. North Cascades National Park, Washington
33. Olympic National Park, Washington
34. Petrified Forest National Park, Arizona
35. Pinnacles National Monument, California (wilderness portion)
36. Point Reyes National Seashore, California (wilderness portion)
37. Redwood National Park, California
38. Rocky Mountain National Park, Colorado

39. Saguaro National Monument, Arizona (wilderness portion)
40. Sequoia National Park, California
41. Shenandoah National Park, Virginia
42. Theodore Roosevelt National Park, North Dakota
43. Virgin Islands National Park, Virgin Islands
44. Voyageurs National Park, Minnesota
45. Wind Cave National Park, South Dakota
46. Yellowstone National Park, Wyoming
47. Yosemite National Park, California
48. Zion National Park, Utah

NPS Areas Designated as Class II Floor Areas

1. Alagnah Wild River
2. Amistad National Recreation Area
3. Aniakchak National Monument and Preserve
4. Apostle Islands National Lakeshore
5. Assateague Island National Seashore
6. Bering Land Bridge National Preserve
7. Big Cypress National Preserve
8. Bighorn Canyon National Recreation Area
9. Big South Fork National River and Recreation Area
10. Big Thicket National Preserve
11. Biscayne National Park
12. Canaveral National Seashore
13. Canyon De Chelly National Monument
14. Cape Cod National Seashore
15. Cape Hatteras National Seashore
16. Cape Krusenstern National Monument
17. Cape Lookout National Seashore
18. Channel Islands National Park
19. Colorado National Monument
20. Congaree Swamp National Monument
21. Coulee Dam National Recreation Area
22. Cumberland Island National Seashore
23. Curecanti National Recreation Area
24. Cuyahoga Valley National Recreation Area
25. Death Valley National Monument
26. Delaware Water Gap National Recreation Area
27. Denali National Preserve
28. Dinosaur National Monument
29. El Malpais National Monument

30. Fire Island National Seashore
31. Fort Jefferson National Monument
32. Gates of the Arctic National Park and Preserve
33. Gateway National Recreation Area
34. Gauley River National Recreation Area
35. Glacier Bay National Park and Preserve
36. Glen Canyon National Recreation Area
37. Golden Gate National Recreation Area
38. Great Basin National Park
39. Gulf Islands National Seashore
40. Indiana Dunes National Lakeshore
41. Jean LaFilte National Historical Park and Preserve
42. John Day Fossil Beds National Monument
43. Katmai National Park and Preserve
44. Kenai Fjords National Park
45. Kobuk Valley National Park
46. Lake Chelan National Recreation Area
47. Lake Clark National Park and Preserve
48. Lake Mead National Recreation Area
49. Lake Meredith National Recreation Area
50. New River Gorge National River
51. Noatak National Preserve
52. Organ Pipe Cactus National Monument
53. Padre Island National Seashore
54. Pictured Rocks National Lakeshore
55. Ross Lake National Recreation Area
56. Saint Croix National Scenic Riverway
57. Santa Monica Mountains National Recreation Area
58. Sleeping Bear Dunes National Lakeshore
59. Timucuan Ecological and Historic Preserve
60. Upper Delaware Scenic and Recreational River
61. Whiskeytown National Recreation Area
62. White Sands National Monument
63. Wrangell-St Elias National Park and Preserve
64. Wupatki National Monument
65. Yukon-Charley Rivers National Preserve

All other NPS units are class II areas.

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PROTECTION OF AESTHETIC VALUES

This section discusses certain values of parks, sometimes intangible and here collectively referred to as "aesthetics," that are to be protected along with tangible resources. These values relate to the visitor's perception of a park and its surroundings through the senses, and include solitude.

DEFINITIONS

Aesthetic value A value, in the framework of natural resource management in the NPS, that is attributed by people to natural, unmanipulated conditions and is perceived through the senses--by seeing, hearing, touching, smelling, and tasting. Aesthetics in the context of the built or cultural environment is not addressed in this Guideline.

POLICY AND PROGRAM OBJECTIVES

NPS Management Policies states:

> The individual parks contain various tangible natural and cultural features such as animals, plants, waters, geologic features, historic buildings and monuments, and archeological sites. They also have intangible qualities such as natural quiet, solitude, space, scenery, a sense of history, sounds of nature, and clear night skies that have received congressional recognition and are important components of people's enjoyment of parks. These NPS Management Policies use the terms resources and values to mean the full spectrum of tangible and intangible attributes for which parks have been established and are being managed. (1:3)

Management Policies makes numerous references to aspects of aesthetics as central issues in the considerations that go into resource management. It includes, under the natural resources and values that the NPS must protect, "aesthetic values, such as scenic vistas, natural quiet, and clear night skies." (4:1)

On noise: "The National Park Service will strive to preserve the natural quiet and the natural sounds associated with the physical and biological resources of the parks.... Activities causing excessive or unnecessary unnatural sounds in and adjacent to parks...will be monitored, and action will be taken to prevent or minimize unnatural sounds that adversely affect park resources or values or visitors' enjoyment of them." (4:18)

On artificial light: "The National Park Service will cooperate with park neighbors and local government agencies to seek to minimize the intrusion of artificial light into the night scene in parks with natural dark, recognizing the part that darkness and the night sky play in the overall visitor experience. In natural areas, artificial outdoor lighting will be limited to basic safety requirements and will be shielded when possible." (4:18-19)

AUTHORITIES

General authorities are discussed in Chapter 1.

Individual park statutes and proclamations articulate purposes and objectives that specifically include solitude, scenic beauty, "natural curiosities," and "wonderful objects." For example, the legislation that established North Cascades National Park states, "In order to preserve for the benefit, use, and inspiration of present and future generations certain majestic mountain scenery, snow fields, glaciers, alpine meadows, and other natural features..." (16 USC 90).

Other statutes of general or specific applicability, including the National Environmental Policy and Wilderness Acts, can provide forums and processes by which aesthetic considerations may be explicitly addressed.

RELATIONSHIP TO OTHER GUIDANCE

Most other sections of this Guideline, insofar as they address maintenance of natural conditions in parks, give guidance in protecting aesthetic values. Visibility is specifically discussed in Chapter 2, Air Resources Management, and crowding in Chapter 3, Backcountry Recreation Management.

PROGRAM GUIDANCE

Protection of aesthetic values is not a program in itself but is an element of most natural resource management programs. It may be argued that aesthetics is the over-arching principle that unites the various management strategies discussed in this Guideline. Our current visitors and the future generations for which we are managing parks "unimpaired" should be able to perceive the same objects (or the same types of objects)--whether animate or inanimate--and processes in the same contexts that existed when the park was established.

Because of the nature of sensual experience, the boundaries of parks are not necessarily determinative; what happens outside the park that can be perceived by people in the park is as much a part of aesthetics as the objects and activities within the park's boundaries. And, the frequency with which certain activities may occur and the degree to which they are perceptible may have a significant effect on whether the activity is evaluated in aesthetic terms. A one-time or sometime occurrence would probably not be considered in aesthetic terms; something that occurs repeatedly and which intrudes on consciousness probably would.

I. Basic Aesthetic Consideration Questions

To determine whether a proposed action or activity may affect resources and values important to the aesthetic experience, consideration of the following questions may be helpful. The questions can assist not only in evaluating the activities and actions that take place outside park boundaries but also in those under the regulatory control of the NPS within park boundaries.

1. Could the action or activity be seen from the park? From a developed overlook, road, or trail? Would the action or activity be continuously or intermittently seen? Are there any alternative sites that are less visible or not visible from the park?

2. Could the action or activity be heard in the park? Where in the park would the sound be most noticeable or intrusive? From developed overlooks, headquarters areas, or trails? Would the sounds be continuous or intermittent? Are there any ways in which the effects of the sound could be mitigated or lessened?

3. Would the perceptible sight or sound change the nature or quality of the visitor's experience? In what ways?

4. Would there be a perceptible odor in the park?

5. Does the frequency or duration of the activity or action affect the degree to which it could be perceived?

As these questions indicate, systematically looking at the effects of proposed activities or actions aims at evaluating what may be lost, rather than what has been generally thought to describe the existing resource condition. For example, routine baseline monitoring of natural resources would not ordinarily take into account the degree of quiet that characterizes a park or the clarity of night sky, but these are precisely the kinds of issues that come under the framework of aesthetics. Resource managers should learn to look at actions and activities in different ways so as to incorporate these issues into planning and management decision-making.

Aesthetic considerations can be quantitatively monitored. It is possible to map viewsheds and photograph visibility. Air quality and weather data can provide limited modeling for visibility and odor concerns. Various characteristic of natural and human-caused sounds can also be measured.

Unfortunately, there is no objective, numerical standard or threshold that can be employed to state what constitutes an aesthetic effect. As is often the case in NPS management, judgment is necessary. Effects on aesthetics also should be analyzed in the context of cumulative effects of a number of different activities or actions, both within and outside parks. What could be insignificant alone (for example, one helicopter trip near a popular overlook) could become significant in the context of other activities or actions (one helicopter trip in combination with nine diesel buses and a nearby, audible, and visible clearcutting operation).

It is often the case that frequency or duration of an activity or action causes it to be transformed from being acceptable in the park or its vicinity, in aesthetic terms, to being unacceptable. Scenic overflights were considered to be acceptable over the Grand Canyon until the numbers and duration of the flights caused a deterioration of the aesthetic experience for other park visitors.

Limitations on backcountry use may be based, in part, on the potential for adverse effects on visitor aesthetic experience from too many other users, in addition to effects on the natural resources themselves. Sociological studies can be useful to evaluate visitor preferences and aesthetic effects (see Noe and Hammitt, 1988), while ethnographic research can be used to document the aesthetics, preferences, and concerns of Native American and other communities.

II. Opportunities for Cooperation

The courts have been reluctant to expand the regulatory control of the Service for aesthetics beyond designated park boundaries. In at least one case where the NPS sought to stop activities that threatened to have deleterious effects on the aesthetics of resources managed by NPS (building heights in Rosslyn, Virginia, across the Potomac River from Washington, D.C.), the Court specifically ruled against such expansion of NPS regulatory control. (United States v. County Board of Arlington County, 487 F. Supp. 137; affirmed, 611 F. 2d 1367 (4th Circuit 1979). In the past, it was sometimes possible to convince the Congress to appropriate funds either to purchase or condemn lands where incompatible activities were proposed. Given current budget constraints, land acquisition can no longer be considered a reasonable option for routinely dealing with activities that may adversely affect park resources and aesthetics. (See also Chapter 4, Land Acquisition and Protection.)

Thus, NPS managers should be alert for opportunities to use methods other than litigation or Congressional appropriations to preserve the aesthetic integrity of parks. In most circumstances where actions or activities can adversely affect aesthetics in parks, permitting processes of one type or another offer opportunities for NPS participation and input. Some regional and local units of government (e.g., states, counties, and townships) prepare land use plans, master plans for development, or comprehensive zoning schemes. During the development of these plans, superintendents can and should provide information on how certain activities may be undesirable from a natural resource management and aesthetic perspective. The NPS can help protect visibility in parks by participating in the development of state implementation plans under the Clean Air Act. (See Chapter 2, Air Resources Management.)

In addition, other federal agencies conduct comprehensive planning similar to that of the NPS. Where park lands are bordered by lands managed by other federal agencies, participation in the planning for such things as timber cuts or oil and gas leasing can sometimes result in greater sensitivity to the aesthetic protection needs of parks. Other agencies, however, are often not aware of NPS resources or of the NPS mandates to protect aesthetic values. It consequently may be difficult to have them fully understand the aesthetic dimension of park management because of their own multiple-use mandates. Another difficulty with participating in such planning processes is that it is virtually impossible during the planning stages of an undertaking to anticipate every conceivable activity that may adversely affect aesthetic values. By the time the specifics of a development proposal are available, permitting processes such as those under the Clean Air Act or Clean Water Act (which are detailed elsewhere in this Guideline) may be more useful in ensuring the consideration of aesthetic values.

III. Examples of Aesthetic Values Protection in Park Resource Management

The Surface Mining Reclamation and Enforcement Act of 1978 generally prohibits surface coal mining operations in units of the National Park System. It also allows for prohibition of mining where "mining will adversely affect any publicly owned park." In a process outlined in section 522 of the Act, individuals may file petitions to have lands designated as unsuitable for all or certain types of mining. In one such petition, areas visible from overlooks in Bryce Canyon National Park were found to be unsuitable for surface coal mining operations. The Secretary's decision on that petition stated, among other things, that,

> "mining in the designated area would cause significant cumulative impacts on Bryce Canyon National Park by reducing visibility, by creating dust plumes and large disturbed areas which would be visible for long periods of time from the park, and by generating mechanical activity and blasting that would be audible from the park, thereby adversely affecting the values for which the park was established and, thus, the experience of park visitors." (Secretary Cecil D. Andrus, December 18, 1980, OSM Reference No. 79-5-001).

As part of its responsibilities to locate a site for a repository for high level nuclear waste, the Department of Energy proposed a site immediately adjacent to Canyonlands National Park for consideration. The NPS participated on review teams, provided information, commented on NEPA documents, and independently evaluated a number of issues related to the repository site. NPS opposition to further consideration of the site rested on potential interrelation of the hydrology at the site with the park, other natural resource issues, and general aesthetic bases--it would be visually and audibly intrusive, visitor experience would be adversely affected (e.g., alteration of the night lighting conditions), and the construction of such a massive industrial facility would affect NPS ability to manage resources unimpaired. Ultimately, other sites were selected for further evaluation but the NPS contentions concerning potential effects on the aesthetic dimensions of the park appear to have been important in the decision-making process.

Recently, the County Commission in Washington County, Maryland enacted restrictions on landowners with property bordering Antietam National Battlefield. Landowners must submit development plans if "changes would potentially affect the area's historic character." (The Washington Post, June 17, 1989). The impetus behind the County's imposition of restrictions is to provide a buffer to the battlefield and maintain the character--an aesthetic consideration--of the Civil War site.

There are, no doubt, a number of other examples of actions by superintendents and staff where the aesthetic experience in the park was the basis for NPS participation in local, state, and federal permitting or other processes. Their actions to prevent inconsistent land uses and zoning or to mitigate threats to aesthetic experiences in parks are part of effective resources management.

ROLES AND RESPONSIBILITIES

The responsibilities for identifying aesthetic values rest primarily with the park. **Resource managers** should be able to identify the contribution that aesthetic values make to the totality of the park experience. By focusing specific attention on aesthetics, managers should be able to identify and describe those values in planning documents and to incorporate them into interpretive materials and programs. The **regional and Washington offices** can assist in developing strategies for identification and protection of aesthetic values based on experience gleaned from other parks. In addition, the regional and Washington offices may be in a position to provide funding or expertise that will enable research that may more adequately describe the aesthetic dimension of park experience and values.

REFERENCES

Noe, F. P. and W. E. Hammitt (eds.) 1988. Visual Preferences of Travelers Along the Blue Ridge Parkway. Scientific Monograph Series, No. 18. USDI, National Park Service, Washington, D. C.

FIRE MANAGEMENT
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FIRE MANAGEMENT

Fire is a natural component of many ecosystems. Therefore, in parks fire should be allowed to play its natural role where feasible. The many situations in which fire is not feasible leads to the need for various kinds and degrees of management. All fire is managed, whether actively or passively. All wildland fires in parks are either wildfires or prescribed fires. The only real difference is whether the fire contributes toward (prescribed fire) or is counter to (wildfires) the resource management objective of the park. No two parks are identical. Each one will have a fire program that reflects the broad NPS policy, but, equally important, one that reflects the park's specific characteristics, legislative obligations, and environmental and social considerations.

Fire management policies and technical guidance are provided in the NPS Management Policies and NPS-18, the Wildland Fire Management guideline. The main purpose of this section of NPS-77 is to describe the types of research and resource information which should be collected in support of fire management planning. If this resource information is not available, then this information need should be identified in the resource management plan.

POLICY AND PROGRAM OBJECTIVES

The NPS Management Policies states that:

> Park fire management programs will be designed around resource management objectives and the various management zones of the park. Fire-related management objectives will be clearly stated in a fire management plan, which is to be prepared for each park with vegetation capable of burning, to guide a fire management program that is responsive to park needs.
>
> All fires in parks are classified as either prescribed fires or wildfires. **Prescribed fires** include fires deliberately ignited by managers (**prescribed burns**) or fires of natural origins permitted to burn under prescribed conditions (**prescribed natural fires**) to achieve predetermined resource management objectives....All fires that do not meet the criteria for prescribed fires are **wildfires**. (4:14, emphasis added)

As stated in NPS-18, fire is an integral component of natural resource management. It may be used to:

- restore or maintain natural ecosystems
- influence natural successional patterns
- restore or maintain an historic scene
- restore or maintain vistas

- reduce fuels which contribute to a wildfire hazard
- create fuelbreaks near developments or park boundaries
- enhance the habitat of sensitive species
- control exotic species

Fire may be excluded for the protection of natural or cultural resources, to meet various legal requirements, or because its presence may be incompatible with other park values or resources, or with those of park neighbors.

The use or exclusion of fire must be in support of the objectives defined in the resource management plan. The resource management plan must clearly articulate the park's resource objectives and the role, if any, which fire can play in achieving these objectives. Specific objectives for fire management are documented in the park fire management plan.

AUTHORITIES

General authorities are discussed in Chapter 1. Related statutory authorities for fire management activities are the Clean Air Act, the Clean Water Act, the Endangered Species Act, and the Wilderness Act.

RELATIONSHIP TO OTHER GUIDANCE

The most detailed guidance on fire management is found in NPS-18, the Wildland Fire Management guideline. The NPS fire policy was changed in 1968 to allow prescribed fire. The policy was amended in 1974, and reconstituted into NPS-18 in 1978. Fire management policies have been revised subsequently as new practices or circumstances have warranted a revision. The NPS policy falls within DOI policy at 910 DM, 1, 2, and 3. The NPS Western Region Fire Monitoring Handbook, 1990, provides monitoring policies and procedures for that region and may be useful elsewhere. See also NPS-12, the Environmental Compliance guideline.

PROGRAM GUIDANCE

If a fire management program is to succeed it must be integrated with resource management and park operations. The overall guidance for the fire management program is provided by the fire management plan. The objectives of the plan should be clearly stated, and quantified if possible (see NPS-18). Information necessary to develop objectives, accurately describe the ecosystems and fire effects, and evaluate and revise the program should be collected from numerous sources. The issues to be addressed may include, but are not limited to, the following:

1. Clear articulation of resource management objectives, and how the presence or absence of fire can achieve these objectives. Unclear resource management objectives, such as "to restore natural conditions," result in weak or poorly defined fire management objectives.

2. The degree to which aboriginal cultures affected or determined the ecosystems which were found by European settlers, and the need, if any, to mimic this influence.

3. Standards and techniques for monitoring the progress and effects of the management program, and its attainment or nonattainment of objectives. Monitoring includes not only the measurement of short-term objectives such as hazard fuel reduction, but also of long-term trends which will detect the occurrence of unexpected results such as the post-fire invasion of exotic species.

4. Research which describes the effects of fire on various ecosystem components or the effects of deviation from the natural fire regime as the result of historic and current fire suppression.

5. Research on the environmental impacts of fire suppression and management activities on the ecosystem.

6. Research on the frequency and pattern of historic fires which occurred prior to the arrival of European settlers. Research which addresses the frequency but not the spatial extent of these fires does not provide adequate information for resource management planning purposes.

7. The extent to which the various land use patterns found in and around the NPS area interfere with the natural processes which influence the area. If natural fire is incompatible with current land use patterns, prescribed burns should be used to simulate natural fires.

   (The presence of these land use patterns may require the use of prescribed burns to remove fuels which, even if natural in character, pose a threat. If the fuels are such that prescribed burning cannot be done because of the high risk of fire escape, then it follows that prescribed natural fires cannot be allowed in such fuels either.)

8. A review process which involves the public in the generation, management, and revision of the objectives and procedures of the program.

Substantial literature exists on fire ecology, history, effects, management, and monitoring. While complete information in support of the planning process is desirable, a lack of information does not necessarily mean that an area cannot have a prescribed fire program.

The resource manager should assemble all available information, identify in the resource management plan critical topics for research, and develop the fire management plan with the best available information. Conversely, a lack of information does not excuse nebulous objectives, nor should the program's philosophical goals outstrip the technical ability of management to execute the program.

ROLES AND RESPONSIBILITIES

Fire management involves a complex array of roles and responsibilities. The park's fire management plan is generated by the **resource manager** and/or by fire management personnel, recommended for approval by the **superintendent**, reviewed by the **regional fire management officer** with advice from the **regional chief scientist**, if necessary, reviewed by the **Washington Office Branch of Fire Management** (located at the Boise Interagency Fire Center), and finally approved by the **Regional Director.**

Documents for specific prescribed fire operations, such as prescribed burn management plans, are approved by the superintendent after review and concurrence by subject matter specialists and a burn boss with the appropriate qualifications. Additionally, superintendents or the acting superintendent are required to certify in writing daily that adequate forces are available to ensure that every prescribed natural fire in their park can be kept in prescription. This means that all staffing functions are met, and that sufficient forces are available to keep the fire within a designated area. Refer to NPS-18 for specific procedures.

REFERENCES

Final Report on Fire Management. 5/5/89. U.S. Department of the Interior and U.S. Department of Agriculture.

Pyne, Stephen J. 1982. Fire in America. Princeton University Press.

INTEGRATED PEST MANAGEMENT
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INTEGRATED PEST MANAGEMENT

In every park there may inevitably be pest problems. However, the mere presence of a particular species does not constitute a pest management problem. NPS Management Policies (Chapter 4) lists specific criteria that must be met before exotic or native species may be managed. The IPM process, if followed, helps determine if a pest management problem exists and provides a process for developing or selecting pest management strategies.

Whether pest problems are associated with the preservation of historic structures or the prevention of forest devastation, the mandate of the NPS is the same. The Integrated Pest Management Program (IPM) process involves research and planning that will enhance the Service's ability to protect the resources within parks in an effective and ecologically sound manner. The IPM process is designed to ensure that the most environmentally sound approach to pest management is the one selected for treatment.

Implementation of the program is the responsibility of the superintendent, as well as the person he or she designates as IPM coordinator. It is the responsibility of all persons involved in the purchase, storage, and application of pesticides in any NPS unit to ensure that the IPM procedures and NPS policies are followed completely.

The purpose of this section is to provide managers with an overview of the integrated pest management concept, of NPS and Departmental policies concerning the use of pesticides, of the various laws and regulations which directly or indirectly affect the use of pesticides, and with directions for applying for approval to use pesticides.

This section of NPS-77 revises and supersedes all previous instructions and guidelines concerning the use of pesticides in the National Park System.

DEFINITIONS

Pest A population of organisms that interferes with the purposes of the park. It is critical to differentiate between native and exotic pests. The process of designing pest management measures may be influenced significantly depending upon the management zone where the pest is found and whether the pest is exotic or native.

Exotic species A species occurring in a given place as a result of direct or indirect, deliberate or accidental actions by humans. (See Chapter 2, Exotic Species Management.)

Native species A species that occurs and evolves naturally at a given location without human intervention or manipulation. (See Chapter 2, Exotic Species Management.)

Integrated Pest Management (IPM) The selection, integration, and implementation of pest management methods based on predicted economic, ecological, and sociological consequences. IPM

can also be defined as a decision-making process which helps one decide if a treatment is necessary and appropriate, where the treatment should be administered, when treatment should be applied, and what strategies should be integrated for immediate and long-term results.

Pesticide Any substance or mixture of substances that is used in any manner to destroy, repel, or control the growth of any viral, microbial, plant, or animal pest or otherwise noxious or unwanted species. This reflects the definition of pesticide under the Federal Insecticide, Fungicide and Rodenticide Act. In addition, within the context of the NPS pest management program, any substance which has an EPA registration number, with the exception of some cleaning substances, is considered a pesticide, and its use on NPS lands is subject to the review and approval procedures established by the NPS.

Restricted use pesticide EPA may classify a pesticide as restricted use because of its potential impact on health or the environment, or because of its formulation. Restricted use pesticides can be purchased and applied only by a certified applicator, or by a person under the direct supervision of a certified applicator (see below).

General use pesticides Pesticides not classified as restricted use.

Certified applicator Any individual who is certified under the Federal Insecticide, Fungicide and Rodenticide Act to apply restricted use pesticides. A certified applicator may be a private applicator or a commercial applicator.

Private applicator An individual who is certified to use or supervise the use of restricted use pesticides for purposes of producing any agricultural commodity on property owned or rented by the private applicator (see also commercial applicator).

Commercial applicator An individual who is certified to use or supervise the use of any pesticide which is classified for restricted use for any purpose or on any property other than as provided under private applicator (see also private applicator).

POLICY AND PROGRAM OBJECTIVES

The NPS policy establishing integrated pest management as the preferred method for managing pest species in the NPS has evolved from previous policies, executive orders, and a presidential memorandum (August 2, 1979). In accordance with NPS Management Policies:

> Integrated pest management procedures will be used to determine when to control pests and whether to use mechanical, physical, chemical, cultural, or biological means.... The choice to use a chemical pesticide will be based on a review by regional and Washington office coordinators of all other available options [e.g., mechanical, physical, biological, cultural, and regulatory] and a determination that these options are either not acceptable or not feasible....Chemical pesticides that are not specifically exempt from reporting

(regardless of who the applicator is) will be used only with prior approval by the Director on an annual basis. (4:13,14)

In addition, Departmental Policy (DM 517 1) requires approval by the Department of the Interior's Office of Environmental Affairs when pesticide use projects meet certain criteria.

The criteria for submitting projects for Departmental review are:

1. all pesticide uses classified as Restricted Use by the U.S. Environmental Protection Agency (EPA),

2. pesticide uses that involve aquatic application or situations in which the applied pesticide could reasonably be expected to get into water areas,

3. pesticide uses that can be expected to affect threatened or endangered plant or animal species,

4. pesticide uses that consist of one application to more than 2,560 acres (four sections).

Implementation of the IPM policy requires training for all employees involved in the management of pest problems, especially for those who use pesticides, supervise those who use pesticides, or purchase pesticides (contracting personnel). For further discussion of certification requirements, see IV A. Certification of Pesticide Applicators, below.

AUTHORITIES

In addition to the general authorities discussed in Chapter 1, a presidential memorandum and a variety of laws, regulations, and executive orders indirectly or directly affect the decision to use pesticides. These authorities may be grouped into four categories: pesticide use, protection of nontarget species, worker/applicator safety, and storage/disposal of pesticides or pesticide residues.

I. Pesticide Use

The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) and the regulations established by EPA (40 CFR 116-117, 165, 170-172) are the primary guidance governing pesticide registration, pesticide usage, the training and certification of pesticide applicators, and the criminal and civil penalties associated with the misuse of pesticides. FIFRA also delegates the enforcement of FIFRA to the individual states. The states have also established legislation and regulations further defining the above activities. Each park IPM coordinator should become familiar with state laws governing pesticide usage.

In addition, there is a presidential memorandum directing the establishment of integrated pest management procedures by federal agencies.

II. Protection of Nontarget Species

Under the Migratory Bird Treaty Act, a permit is required from the U.S. Fish and Wildlife Service (FWS) if proposed activities will affect migratory birds.

Under the Endangered Species Act, the EPA and FWS are developing a program that will prohibit or limit the use of certain pesticides within the range of endangered species. These requirements will become part of pesticide labels and labeling, and the prohibitions will be enforceable under FIFRA.

III. Worker Safety

Pesticide labels contain directions for the protection of workers and directions for reducing exposure to nonapplicators. Violation of these directions constitute violation of FIFRA.

Under the Occupational Health and Safety (OSHA) Hazard Communication Standard (29 CFR 1910.1200), employers must provide workers with training, protective equipment, and information about hazardous substances. The employer is also required to maintain Material Safety Data Sheets about these substances and provide the employee with a copy if it is requested by the employee.

IV. Pesticide Storage and Disposal

The storage and disposal of most pesticides are governed by FIFRA, with specific directions provided on the label. In addition, a number of pesticides have been classified as hazardous waste under the Resource Conservation and Recovery Act. The pesticides which have been classified as hazardous materials are listed in 40 CFR 261.30-33. See further, Chapter 2, Hazardous Waste Management.

RELATIONSHIP TO OTHER GUIDANCE

Because pesticides can be used under a variety of management situations and have the potential for adverse effects on natural and cultural resources, the following sections of this Guideline should also be consulted: Chapter 2, Vegetation Management, Native Animal Management, Freshwater Resources Management, Endangered, Threatened, and Rare Species Management, Exotic Species Management, Hazardous Waste Management, and Public Health and Safety; Chapter 3, Agricultural Uses, Rights-of-Way and Easements, and Backcountry Recreation Management; Chapter 4, Environmental Compliance; and Chapter 5, Special Use Permits and Collections.

PROGRAM GUIDANCE

This section of the Guideline applies to any pesticide use within the National Park System, except for cleaning solutions used in restrooms, restaurants, etc., and includes but is not limited to NPS personnel, park, regional, and Washington offices and divisions, including the Denver Service Center, Harpers Ferry Center, Williamsport Training Center, park residents, private contractors, and concessioners; cooperative associations; special use permittees, including but not limited to agricultural, grazing, and historic lessees, rights-of-way and scenic easement donors; other residential property or commercial users; and any others who apply or supervise use of pesticides on lands or facilities owned, managed, or regulated by the NPS.

Regional offices must review and deny or recommend approval of all proposed pesticide use (using a Pest Management Report Form 10-21A--See Exhibit 1). The Washington Office must review and approve or deny all proposed pesticide use on lands or facilities owned, managed, or regulated by the NPS. For those proposed uses that are denied, the Washington Office will provide alternative recommendations. All pesticide use, except for non-NPS purchased and personally used insect repellents, must fully conform to all NPS policies and guidelines; it requires regional and Washington Office approval and an assigned 10-21A number prior to purchase or use. In addition, all pesticide use must be reported annually on a Pesticide Use Log Form (see Exhibit 1) submitted through the regional IPM coordinator to the Washington Office.

To prevent potential long-term contamination, improper use, or other safety hazards, all pesticides used in NPS residences must also conform to NPS pesticide approval, use, and reporting policies and procedures. Individuals living in NPS residences must contact the appropriate park office and request assistance with pest management problems. Park IPM coordinators can supply interested persons with the most recently available IPM information describing alternative management strategies for household and garden pests.

Insect repellents that are not purchased by NPS, and that are personally used by employees or visitors and applied directly to the body or clothing do not require regional and Washington approval and reporting. Health and safety information concerning application, concentrations, and precautions for personal repellents are available from park and regional IPM coordinators.

Personal insect repellents which are purchased by the NPS for use by NPS personnel, Volunteers in Parks, other volunteers, or any other person, or are used on any livestock, must fully conform to NPS pesticide approval, use, and reporting policies.

Except for the use of personal insect repellents, visitors are prohibited from using pesticides in NPS areas.

I. Pesticide Review Process

The annual review of pesticide use proposals begins at the park level with the park IPM coordinator. At a minimum, the review includes the regional and Washington offices. In some situations, described earlier, the review process extends to the Departmental level. At each level, the proposal may either be recommended for approval and forwarded to the next level or denied and returned to the previous level for modification or reevaluation. Approvals are granted when nonchemical methods are unavailable, unacceptable, or nonexistent, or when there is a clear and present danger to human health and safety or to significant property or resources. Proposals may be conditionally approved by the Washington Office or the Department pending minor changes suggested by the reviewing official. Proposals which are denied are returned with written explanations, and alternatives are suggested.

A. Park

All requests for the use of pesticides require the annual submission of a Pest Management Program Report (Form 1O-21A). Detailed instructions for completing this form are contained in Exhibit 1. Even if a proposed pesticide use has been previously approved, it must be resubmitted for approval each year. The use of the same pesticide on different pests, with different application tech-niques, should be proposed separately.

Pest problems are usually first noted by a park employee in the course of work. After the problem is brought to the attention of the park IPM coordinator, the problem species is identified and, if it is determined to be a pest, various nonchemical management methods are explored, including "no action." As a last resort, chemical treatment of the pest is considered. After the park IPM coordinator determines the pesticide proposal is consistent with park management plans and that other methods of managing the pest are unacceptable or not feasible, a completed Form 10-21A is prepared for the superintendent's approval. Providing complete and detailed information on the 10-21A at the park level is absolutely necessary for meaningful review at the regional and Washington levels.

Pesticide Use Proposals are approved on an annual basis, with each approval expiring on December 31 of the year of approval. Generally, an annual program call is sent from the Washington Office in November or December for the forthcoming year. Pesticide Use Proposals may be submitted via one of two methods. In situations where the use of pesticides is anticipated, the 10-21A form may be submitted at least 60 days before application. The proposal may be submitted via the Common Pests Module or via a paper form and the mail. Examples of these situations include but are not limited to use of pesticides in an approved IPM Program, use of USDA/USFS Forest Insect and Disease Control funds, use by special use permittees or contract pest management services, and use of pesticides which require Departmental review (Office of Environmental Affairs).

When a pest situation arises where the pesticide need could not be anticipated, rapid pesticide approval can be ensured by using the Pest Module on Common or by receiving approval via the telephone.

Except for situations described above, all other pesticide situations which were not anticipated at the beginning of the year may receive approval via the telephone or may be submitted via the NPS Common Data Base, which has a pesticide use module. (For information about using the Common Data Base see the NPS Common Data Base User's Manual.) For telephone approval the park IPM coordinator contacts the regional IPM coordinator and provides all of the information required to complete a 1O-21A Form. The regional IPM coordinator then contacts the Washington Office and requests telephone approval. If telephone approval is received, the park must submit a completed 10-21A within 10 days.

For proposals which meet the requirements for review by the Office of Environmental Affairs, in addition to a 10-21A the park must submit a Departmental Pesticide Use Proposal Form and a complete copy of the pesticide label. Directions for completing the Departmental Pesticide Use Proposal Form are in Exhibit 1.

B. Region

The regional IPM coordinator receives pesticide use proposals from parks within the region and reviews them before either concurring and forwarding the proposal to the Servicewide IPM Coordinator or denying the request. The decision to concur or deny is based upon NPS and Departmental policy and guidelines, availability of nonchemical alternatives, and whether or not the proposed pesticide is registered by the EPA for its intended use.

If proposals are denied at the regional level, the regional IPM coordinator should provide an explanation for the action and suggest suitable alternatives (nonchemical or chemical) to the park IPM coordinator.

After action (approval or denial) is taken by the Servicewide IPM Coordinator on proposals forwarded from the region, the regional IPM coordinator notifies the park IPM coordinator of the proposal's status.

C. Washington Office

The Servicewide IPM Coordinator provides final review and approval or denial of all pesticide use proposals (except for those requiring Departmental approval). In the case of proposals which are potentially controversial or require clarification or revision of NPS policy, the Servicewide IPM Coordinator makes recommendations to the Director.

The decision to concur or deny is based upon the proposals' conformance to NPS and Departmental policies and guidelines, a determination whether other alternatives are available or feasible, and

whether the proposed pesticide is registered for the proposed use. Proposals requiring Departmental review are forwarded to the Office of Environmental Affairs (OEA) after receiving Washington Office concurrence and recommendation for approval.

If proposals are denied at the Washington Office level, the Servicewide IPM Coordinator provides an explanation for the action and suggests suitable alternatives (nonchemical or chemical) to the regional IPM coordinator.

D. Department of Interior, Office of Environmental Affairs

The OEA provides final review and approval for all proposals which meet the criteria discussed in Policy and Program Objectives, above.

E. Interagency Consultation

In cases where proposed applications of pesticides may affect threatened or endangered species or migratory birds, the park IPM coordinator must contact the U.S. Fish and Wildlife Service for consultations or appropriate permits or clearances. For projects that might affect threatened or endangered species, the park should consult with FWS and receive written confirmation or opinions from the FWS. For projects which may affect adjoining land managing agencies or land owners, these individuals should be contacted well before the intended date of application.

In cases where the use of pesticides is proposed to reduce public health hazards, the Centers for Disease Control, Atlanta, Georgia, should be contacted. The regional IPM coordinator or the Washington IPM coordinator must contact the Regional Public Health Sanitarian or the Washington Office Public Health Sanitarian, explain the situation, and request the regional office to ask CDC to determine whether or not a public health hazard exists. The most frequently encountered public health question arises when parks are requested by local mosquito abatement districts to manage mosquito populations to reduce the potential threat of mosquito-borne encephalitides.

F. Scope of Reviews

At the park level, all pest management actions, both chemical and nonchemical, should be reviewed by the IPM coordinator before implementation. If a chemical, biological, or unconventional alternative is selected at the park level, it must be forwarded to the regional and Washington offices for further review.

II. Overview of IPM

Integrated pest management (IPM) is a process for determining if pest management is needed; when management should be initiated (at what population level the pest becomes intolerable and at what population level action should be taken to manage); where and at what frequency

treatments should be applied; and what physical, cultural, biological, or chemical strategies should be employed and how effective these treatments are in achieving management objectives.

IPM integrates compatible techniques to maintain pest damage below an unacceptable injury level while providing protection from threats to public health and safety and to the natural environment. IPM makes maximum use of such naturally occurring pest population regulating factors as weather, predators, parasites, and pathogens. It also utilizes genetically resistant hosts and environmental modification, as well as various physical, cultural, biological, and chemical control techniques.

III. Components of an IPM Program

A. Identification of the Problem

Frequently the presence of an organism is defined as a pest problem. However, the **mere presence** of an organism does not always constitute a pest problem. Thus an important first step in developing an IPM approach to pest management is the identification of the suspected pest species. Identification will provide avenues to obtain more information about the particular species, determine if there is a pest problem, and, frequently, determine the cause of the problem. By obtaining a thorough understanding of the problem, IPM approaches can not only reduce the use of pesticides and their associated environmental effects, but can also provide a long-term, cost-effective approach to problem resolution.

B. Monitoring

Monitoring is the regular observation of specific factors related to the pest population and is fundamental to successful IPM programs. Monitoring is necessary to determine the status of pest populations, and injury and action levels. It is also needed to choose the time and place of treatments that are the most effective and the least disruptive to the natural controls operating to suppress the pest organisms, and that are the least hazardous to human health and the environment. Monitoring is also important in evaluating pest management strategies. Monitoring is required throughout the IPM program and should include regular sampling of the pest population and its natural enemies, potential pests in the same environment and their natural enemies, management decisions and practices that could affect the pest or potential pest populations, and weather conditions.

In developing a monitoring program, the following factors should be addressed:

1. Determine the purpose for the monitoring (e.g., establish injury levels to determine the frequency of treatments, other environmental influences on the pest population, effectiveness of management actions).

2. Determine which target and potentially affected nontarget populations to sample or determine which factors to monitor (e.g., weather, plant phenology, degree days).

3. Determine the frequency of monitoring.

4. Determine appropriate sampling locations and number of sites to monitor.

5. Develop the monitoring procedure.

6. Maintain accurate, detailed records in a manner that can be used for future decision-making.

7. Evaluate pest management treatments for their effects on target and nontarget organisms.

C. Injury and Threshold/Action Levels

The **injury level** is defined as the size of the pest population which causes unacceptable damage sufficient to warrant management of the problem. Determination of injury levels is based on how much damage can be tolerated and how the seasonal variation in the pest population and/or life stage of the pest or host is correlated with unacceptable damage.

The **threshold or action level** is the size of the pest population at which some management action must be applied to prevent the pest population from reaching the injury level. In an IPM program, the objective of management action is to suppress the pest population below the injury level, rather than attempt eradication of the pest.

A monitoring program is necessary to determine injury and action levels. Observations of the pest population must be made at specific locations and then related to damage levels. Many variables affect injury levels, and several seasons of monitoring may be required to determine reliable and predictive injury or action levels. However, "working" injury and action levels may be established during the first season and then refined as more knowledge is gained through the monitoring program.

D. Treatment

A pest management strategy is an overall approach for preventing or suppressing pest populations based on ecological understanding. In order to develop appropriate pest management strategies, it is important to take a holistic view of the pest problem, recognizing the interactions between the pest and its natural enemies such as pathogens, parasites, predators, other natural controls such as weather, and human actions that may be influencing the pest population.

Several considerations must be made when selecting pest management strategies. Consideration must be given to disruption of natural controls, hazards to human health, effects on nontarget organisms, overall damage to the environment, how effective treatments will be in reducing the pest

population below the action level, how feasible it will be to effectively implement treatments, and how cost effective the treatment is over the short and long term.

The IPM concept is based on the fact that combined strategies for pest management are more effective in the long run than a single type of treatment.

1. Summary of Treatment Options

a. Indirect Suppression

Indirect suppression strategies are aimed not at the pest species but at changing the conditions which support pest populations. Indirect suppression approaches are grouped into two major types:

Habitat Modification Pest habitat can be modified in order to reduce pest harborage, food, or other requirements, and enhance the environment required by predators, pathogens, and parasites of the pest.

The most energy and cost effective pest management strategy is to design the pests out of the system when possible. This can be done through the selection and mix of plant species, the design or remodeling of structures and interiors, the contouring of sites, the design of organic waste and other resource management processes, and the extent to which the preferred harborage, food, water, and other environmental requirements of the pest are denied.

Some specific examples are the selection of plants or structural materials that are resistant to pests, support of natural controls, and enhancement of ecosystem diversity and processes; also, designing landscapes or structures that are appropriate to the weather, soils, minerals, water and energy resources of the site and the maintenance system. It is essential to communicate with Design/Planning personnel to prevent pest problems from being incorporated into landscape plans.

Modifying Human Activities Modification or addition of horticultural actions such as mowing, cultivating, watering, fertilizing, pruning, and mulching, with the proper selection of plant materials, can effectively reduce pest management problems. Modification of other human activities such as storage of food in desks, frequent and properly timed removal of garbage, and other sanitation practices will also eliminate or reduce pest management problems. Public education and interpretation about imagined pest problems can reduce apprehension about these pests, and thus eliminate misdirected efforts at reducing nonexistent pest management problems.

b. Direct Suppression

Direct suppression strategies are directed toward the pest population with the intent of reducing the pest population below action levels. These approaches are grouped into three categories: physical/mechanical, biological, and chemical.

Physical/mechanical techniques include removal of the pest through weeding, pruning, and mowing, subjecting the pest to intolerable levels of heat or cold, exclusion by erecting barriers to pest access, use of mechanical traps, and repairing structures.

Biological control relies on the use of naturally occurring predators or parasites to maintain pest populations below injury levels. In some cases, such as exotic species or when natural predators are not maintaining pests at acceptable levels, releases of additional predators/parasites may be necessary. For example, in the management of stable flies periodic releases of parasites are required when proper manure management practices are not followed. In the case of exotic species, predators or parasites may have to be imported and released. However, before any biological control agent is released, especially exotic agents, the potential biological control agent should be tested for potential impacts on nontarget native species and have been approved for release by the Animal and Plant Health Inspection Service, USDA. In addition, biocontrol agents must be reviewed and approved by the Servicewide IPM Coordinator before release.

Chemical treatment involves the use of an EPA-registered pesticide. Pesticides are grouped based on their purpose. For example, insecticides are used to manage insects, herbicides to manage plants, molluscicides to manage snails and slugs, and rodenticides to manage rodents. There is also an increasing array of chemicals that are being designed or developed to disrupt various behaviors such as mating, feeding, egg laying, etc. Other chemicals serve as attractants, repellents, sterilants, or contraceptives. However, most pesticides by design are toxic and therefore should not be considered safe.

E. Evaluation

An evaluation process is also a key component of an IPM approach and is as important as a monitoring program. The evaluation component is used to determine the efficacy and environmental effects of treatment actions, and to identify modifications to pest management programs.

Detailed and accurate record keeping is fundamental to the evaluation process. Not only does it provide a historical record of activities, it also provides information which can be used to justify future activities.

F. Education

Education is a cost-effective strategy. Education efforts should be designed to include all audiences that may be concerned about pest management. Through an effective education program, park

staff will come to recognize potential pest problems and take action before problems develop. Park staff that are informed about the objective of the program are more likely to support it.

Park visitors and others concerned with management of national park areas should be advised of park IPM practices and the benefits of implementing these approaches to specific pest problems.

IV. IPM Program Operations

A. Certification of Pesticide Applicators

Any NPS unit making use of NPS staff to apply a restricted use pesticide must have a certified commercial applicator (see Definitions) on staff and present at the park when pesticides are being applied. It is strongly recommended that any NPS unit making use of NPS staff to apply a general use pesticide or contracting the application of a restricted use pesticide also have a certified commercial applicator on staff and present at the park when pesticides are being applied. The NPS must ensure that agricultural lessees applying restricted use pesticides on NPS land are certified as private applicators. The NPS should ensure that any contracted pesticide applicators using restricted use pesticides and, in some states, general use pesticides, must be certified commercial applicators.

The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) permits uncertified individuals to apply restricted use pesticides provided that the individual is working under the direct supervision of a certified applicator. Currently, "under the direct supervision of a certified applicator" means that unless specified otherwise on the pesticide label or its labeling, the certified applicator must be available if and when needed, even though the certified applicator is not physically present at the time and place the pesticide is applied. In addition to the IPM coordinator, the park safety officer should be made aware of the activity and possibly review procedures and equipment with the applicator.

The following paragraph gives the background for the requirement to have a commercial applicator in the park when pesticides are applied by NPS employees. FIFRA classifies pesticides as either restricted use or general use (see Definitions). Under current federal regulations, parks applying restricted use pesticides must have at least one applicator certified as a commercial applicator to supervise the application. Additionally, some states have determined that federal employees applying any pesticide, either restricted or general use, in the performance of their duties are commercial applicators. Because of this, NPS applicators in states with these regulations must be certified as commercial applicators by the state in which the application will be made. In those states which have not made this determination, the presence of a certified NPS employee in the park during pesticide application will help ensure that questions concerning label directions, state and federal regulations, and use of safety equipment can be answered. The certified applicator will also be able to provide direction in response to spills or other pesticide emergencies. For additional information concerning certification, contact the regional IPM coordinator.

FIFRA also provides direction for certification of pesticide applicators. The District of Columbia and all states except Colorado and Nebraska have developed certification plans and may certify applicators. In Colorado EPA certifies private applicators, while commercial applicators are certified by the state. In Nebraska EPA certifies both commercial and private applicators. Some federal agencies have developed certification programs. However, to ensure conformation to state requirements, it is recommended that NPS applicators obtain certification from the state where the pesticide will be applied.

The purposes for which pesticides are applied can be grouped into a number of categories. EPA has identified specific categories for which the pesticide applicator may be certified and has developed specific standards which must be met for certification in each category. The NPS has identified eight of these categories as appropriate to meet the certification needs of its employees:

1. structural and health related: pesticides used in, on, or around food handling establishments, human dwellings, offices, and any other structures and adjacent areas, public or private; and for the protection of stored, processed, or manufactured products

2. agricultural: pesticides used in the production of agricultural plants as well as on grasslands and noncrop agricultural lands; pesticides on animals and in places on or in which animals are confined

3. right-of-way: pesticides used in the maintenance of public roads, electric powerlines, pipelines, railways, or other similar areas

4. ornamental and turf: pesticides used to manage pests in the maintenance and production of ornamental trees, shrubs, flowers, and turf

5. aquatic: pesticides purposefully applied to standing or running water, excluding application for public health pest management

6. forest: pesticides used in forests, forest nurseries, and forest seed producing areas

7. research and demonstration of pesticides: pesticide applications to test or demonstrate the effectiveness of specified treatments

8. public health: pesticide applications when public health hazards exist as determined by the Centers for Disease Control

B. IPM Planning

A number of parks as well as the Washington Office, Division of Curatorial Services, have developed IPM plans for specific or general pest management situations that periodically develop and need repeated attention. Examples include: Structural Pest Management (San Antonio

Missions), Orchard Pest Management (Hopewell Furnace, Capitol Reef, and Lyndon Johnson), Museum Pest Management (see NPS Museum Handbook, Chapter 5, Biological Infestations), parkwide comprehensive IPM plan (Indiana Dunes), and Gypsy Moth (Shenandoah).

The planning procedure is progressive, requiring certain information. First is a park survey to identify pest species and estimate their importance or abundance. The survey should include exotic species and native species which could damage park resources. Within buildings, a thorough survey would include sketches of problem areas and areas of proposed treatment. Information and literature on specific pests should also be collected.

When these have been completed an action plan or IPM plan can then be developed. The plan can address specific pest species or more general problems such as orchards, ornamentals, or structures, or can be used to document and establish for future reference a plan and list of successful techniques. An IPM plan should contain the following elements: pest name (common and scientific), general geographic range, brief description of pest and potential for damage, location of problem in park, thresholds or tolerance levels, monitoring, alternatives for management (prevention, biological/genetic, mechanical, physical, cultural, and chemical), integration of treatments, current treatments and results, recommended treatments, and post-treatment monitoring.

An IPM plan should describe the overall pest management problems and the program to deal with them. It should also describe the operational aspects of the program, defining individual responsibilities as well as interdivisional relationships within the park.

In addition, if pest management activities are conducted in the park, a project statement must be in the resource management plan. It should specifically and briefly discuss significant pest species.

C. Pesticide Use and Label Instructions

The instructions concerning the use of pesticides on the label and labeling are key to the proper use of a pesticide and are legally binding. The label informs the potential user: if the pesticide may be used to manage a specific pest, if the pesticide may be used on a specific location (site), how to use the pesticide, and the safety precautions that should be taken when using the pesticide.

In some circumstances FIFRA (section 2(ee)) allows the use of a pesticide for control of pests or on a site not specifically listed on the label, or in a manner not specified on the label. These cases include:

a. applying a pesticide at any dosage, concentration, or frequency less than that specified on the labeling unless the labeling specifically prohibits deviation from the specified dosage, concentration, or frequency;

b. applying a pesticide against a target pest that is not specified on the label or the associated labeling, when the application involves a crop, animal, or site which is specified on the labeling; this type of application cannot be used if the labeling states that the pesticide may be used only for the pests specified on the label;

c. employing any method of application not prohibited by the labeling unless the labeling specifically states that the product may be applied only by the methods specified;

d. mixing a pesticide or pesticides with a fertilizer when such mixture is not prohibited by the labeling;

e. any use of a pesticide in conformance with Section 5 (experimental use permits, see latter section), Section 18 (emergency exemption of federal and state agencies), or Section 24 (state authority) of FIFRA; or

f. any use of a pesticide that the Administrator determines to be consistent with the purposes of FIFRA.

D. Reporting Pesticide Use

In addition to having pesticide use approved annually before it is applied on lands or facilities owned, managed, or regulated by the NPS, the parks are required to maintain records for each pesticide used during the year (See Exhibit 1 for a copy of the Pesticide Use Log Form). At the end of each calendar year, an annual report concerning the use of each pesticide is required. This report is submitted by the park to the regional IPM coordinator, who checks the Pesticide Use Log for accuracy, compiles the individual park Pesticide Use Logs, and submits them to the Servicewide IPM Coordinator.

The reporting of all pesticide usage is critical, not only for a park's program, but for the Servicewide program as well. This information is used in a wide variety of ways by both the Washington Office and other parks seeking remedies for various IPM problems. For example, the use of pesticides on NPS lands is a management activity that is sensitive because of the potential environmental and human health impacts. The data provided in the Pesticide Use Logs have been used to support the NPS IPM approach to pest management, defuse sensitive issues, and support NPS positions during litigation.

E. Pesticide Purchase

The policy of the NPS regarding the purchase of pesticides is very specific. NPS personnel are permitted to purchase the amount of pesticide authorized for use during the year of approval. An exception to this policy is allowed if the smallest amount available for purchase is larger than the amount necessary for the project. For example, if one quart of pesticide is needed but it can only be purchased in two quart containers, then the larger quantity may be purchased.

Requisition forms (DI-ls) for pesticide purchase should not be processed without an attached form 10-21A that has been reviewed and approved by the Servicewide IPM Coordinator. If an approved pesticide is unavailable for purchase, any substitutions with different active ingredients will require approval through the same process. The regional or park IPM coordinator is responsible for informing the appropriate purchasing/procurement office of these procedures.

There are a variety of reasons for limiting the amount of pesticide that a park may purchase at one time. Many pesticides have a very short shelf life, are photosensitive, or may degrade on exposure to air; a pesticide's registration may be changed by EPA; a more suitable product or technique may become available; or new information about the environmental impacts may become available. If the pesticide becomes unusable for any of these reasons, the park will be faced with disposing of a pesticide which may have to be treated as hazardous or toxic material. The cost of disposing of these materials often equals or exceeds the purchase price of the pesticide. In addition, pesticides must be stored under specific conditions. For large quantities of pesticides this may require building special storage facilities. There is also the danger that pesticides will catch fire or be involved in fires, potentially creating hazardous or toxic fumes and runoff which require special fire fighting techniques or may require evacuation of personnel.

F. Pesticide Storage

Pesticides are a valuable tool for managing pest problems in structures, historical areas, landscapes, and natural areas, as well as protecting human health and safety. Pesticides are designed to kill and range in potency from slightly toxic to extremely toxic, which requires only a drop to kill an individual. As a result of their potency, some of the factors mentioned under Pesticide Purchase, above, and because of the instability of some pesticides under certain conditions (they may become more toxic or less toxic or change chemical nature altogether), proper storage of pesticides is critical. In addition, pesticides require proper storage facilities to prevent accidents, injuries, spills, or environmental contamination. Design examples for pesticide storage facilities can be obtained from the Servicewide IPM Coordinator.

Pesticide storage facilities must be locked, fireproof, and ventilated, and proper warning signs must be posted. Pesticides must be stored separately from all other substances, and the directions provided on the label or labeling must be followed. In addition, each type of pesticide must be stored on separate shelves. Insecticides and herbicides, for example, should be stored in separate rooms because of the potential for explosive or other violent chemical reactions when these types of pesticides are mixed. Storing pesticides with cleaning fluids, paints, solvents, or other chemical substances unnecessarily increases the opportunities for accidents, fires, etc. Any structure used for the storage of pesticides should be posted, and copies of labels, Material Safety Data Sheets, and inventories should be kept in a locked container outside the storage facility. The geographical location of a pesticide storage structure should be considered carefully; locations near water or upslope from water supplies, for example, are poor choices for a storage facility. Pesticide storage regulations may be found in 40 CFR 165.

Knowledge and awareness are the key elements in proper storage and usage of pesticides. Besides the IPM coordinator, the structural fire crew and the safety officer should be aware of the location and contents of the pesticide storage area. Material Safety Data Sheets and labels for each pesticide stored in the park should be in the possession of the IPM coordinator, the safety officer, and the structural fire crew. The keys and/or combination to the facility must also be available in case of accident. No one person can be expected to be on site at all times and preparations must be made for a worst-case scenario. Proper planning can minimize the possibility of an accident or problem resulting from the storage of pesticides. However, it is also important to be prepared for an accident should it occur in spite of all precautions.

G. Disposal of Pesticides

There are several approaches which will limit the amount of excess pesticide to be discarded. As indicated earlier, NPS policy limits the quantity of pesticide which can be purchased. The pesticide label or labeling also contains information about disposal of pesticides and pesticide containers. Mixing only sufficient pesticide to do the immediate job will eliminate surpluses. However, if small quantities of mixed pesticides remain, they and any rinseate from the container or spray equipment may be applied to the treated area.

If pesticides cannot be disposed of in the manner described above, they may be surplused, given to another agency, or disposed of according to the various federal and state laws and regulations. Donation of surplus chemicals should be documented and records kept for 3 years. See Chapter 2, Hazardous Waste Management, for more detail.

H. Pesticide Safety

Pesticides are toxic substances whose purpose is to kill. If these substances are mishandled, the potential for serious accidents is great. The pesticide label which must accompany each pesticide provides directions concerning appropriate procedures for handling the pesticide. These directions must be followed. In addition to the guidance provided by the label, the following precautions should also be followed.

Unless the label specifies otherwise, applicators should wear protective goggles or face shields, rubber or neoprene gloves, an impervious cap with a brim and drip guard, long pants, a long sleeve shirt, and rubber boots during mixing, loading, application, and cleanup. Depending on the formulation of the pesticide, the applicator should wear a dust mask or respirator approved for the type of pesticide being applied. Mixers and loaders should take the additional precaution of wearing an impervious apron. For additional information about respirators, see 29 CFR 1910.134 and NPS-50, Appendix L.

In spraying liquid pesticides overhead, the sleeves should be inside the gloves; however, pants should never be tucked inside the boots.

Pesticide application equipment should never be worn home or washed in home laundry facilities.

Pesticides should never be transported inside the cab or passenger compartment of a vehicle. Instead, they should be securely stored inside a lockable container in the trunk or bed of the vehicle.

Pesticides must not be stored or placed in unmarked containers. They should never be stored in containers used for food preparation or other food purposes.

Copies of the label and Material Safety Data Sheet should be at the site where pesticides are being applied.

In addition to the safety of the applicator, the safety of park visitors and others not involved with the application of pesticides must be considered. Many pesticide labels now specify minimum periods before unprotected individuals may enter treated areas, or they specify that treated areas must be posted. If the label specifies a re-entry period, treated areas must be posted with signs warning visitors and others not to enter the treated area. The signs should indicate that the area has been treated with a pesticide, indicating when the area was treated, when the area may be re-entered, what materials were used, and the name and telephone number of a contact person.

Some states have passed legislation or are considering legislation that requires applicators to post treated areas. Some legislation also specifies that areas proposed for treatment must be posted for a minimum period before the area is treated.

I. Public Health Uses

Occasionally a need to protect public health arises that requires rapid response and reliance on the expertise of individuals or organizations such as the NPS public health consultants and/or the Centers for Disease Control (CDC). Managing a public health hazard requires coordination with a variety of individuals. For example, management of an encephalitis outbreak in a park would involve coordination with the park, regional, and Washington Office IPM coordinators, the park and regional public health consultants, the state agency for public health, and the CDC. Decisions to implement management actions should be based on a determination by these organizations that a public health hazard exists and on recommendations by these organizations that pest populations should be managed.

For situations such as insanitary conditions (e.g., unacceptable levels of arthropod or rodent populations in food preparation facilities, rest rooms, housing, etc.), pest management programs should be based on consultations with NPS public health consultants and determinations by them that these conditions must be corrected to protect public health.

Approval to use a pesticide for any of these situations is still required from the Washington Office IPM coordinator.

J. Research/Experimental Use Of Pesticides

Approval may be granted for the experimental evaluation of currently registered pesticides within national parks. However, the circumstances under which approval may be given are limited, specific, and carefully controlled. Examples of experimental use are evaluation of the efficacy of one or more pesticides in unique site/pest complexes; evaluation of newly registered pesticides; and comparison of strategies involving pesticide tactics with nonchemical approaches.

Requests for approval of an experimental use will follow the same review process used for other pesticide projects. However, in addition to the Pest Management Program Report (Form 10-21A), the request must include a narrative justification for the project and a description of the experimental design, including the format for data collection.

In developing the justification for the project, the following steps must be taken:

1. Determine the risk to the employees, visitors, or park resources associated with the experiment.

2. Determine the potential benefit for park resources, employees, or visitors, and that there is a clear and definite need for this information.

3. Determine that the information to be gained will be new and has not been determined previously through other valid and relevant experimentation.

4. Determine that the information cannot be gained through experimentation outside the park, or that such experimentation is not likely to occur without park participation.

5. Determine that the experiment has been designed to conform to accepted scientific practices and that the design will provide data which can be tested or analyzed statistically.

The regional chief scientist must review the project proposal and attach his or her recommendation that the project be approved prior to submission to the regional and Servicewide IPM coordinators.

It must be understood that the applicator is responsible for any adverse effects to human health or to the environment that might result from an experimental use of a pesticide. It is advisable, therefore, that the project be performed by an experienced researcher or under the close supervision of a researcher as well as a certified pesticide applicator.

At the end of the calendar year the current data and summary of the findings must be submitted along with the Pesticide Use Log. If additional study is planned, the project must be re-submitted for annual approval.

If, on the basis of the findings, it becomes desirable to expand the use beyond the realm of research, it will then be necessary to obtain a label amendment. This should be done through the manufacturer of the pesticide. This process is lengthy and requires extensive review by EPA. In some cases, such as when the approach or new use does not add significantly to the market or sale of the pesticide, manufacturers may not pursue the additional labeling. It would then be the responsibility of the NPS to seek the new labeling.

K. Contracted Pest Management Services

Some pest management practices require the services of a pest management firm, frequently referred to as pest control operators (PCO). These firms offer many services for which parks may not have the equipment or expertise. Services offered range from one-time treatments for termites to repeated monthly visits to treat for recurring problems such as cockroaches, commensal rodents, spiders, ants, wasps, etc. The standard approach for these repeated visits is to spray the baseboards or other infested areas with pesticides. The PCO will provide a specific service for a fixed price and require that a contract be signed. Many parks have successfully worked with PCOs to modify these contracts and obtain pest management services that rely less on pesticides and more on an IPM approach. These modified contracts provide greater protection to NPS resources, but they also require a greater involvement on the part of the NPS. Therefore, it is necessary to ensure that the contract specifications literally spell out what is permitted and what is not permitted on NPS property. Specifications should include pest identification, monitoring on a regular basis, and no pesticide application unless thresholds are reached (thresholds should be agreed upon prior to signing the contract). Exhibit 2 provides suggested language to be included in contracts established with PCOs. Although the example in Exhibit 2 describes a contract for pest control services in a structure, it has many aspects that can be incorporated into other pest management situations.

ROLES AND RESPONSIBILITIES

I. Superintendent

The ultimate responsibility for all pest management issues within a park resides with the **superintendent**. Consequently, superintendents determine within the context of NPS Management Policies and other guidance what constitutes a pest in relation to park resources. The superintendent must understand the principles and practices of IPM as well as appreciate the broad scope of IPM strategies and tactics and how they relate to park resources and activities.

In order to provide the degree of oversight and consistency necessary for a successful IPM program, the superintendent should designate a park IPM coordinator. The superintendent's selection should be an individual who has the interest and capability of addressing all pest management issues regardless of the pest involved or the resource affected. The superintendent should ensure that the park IPM coordinator participates in all management decisions that may directly or indirectly influence pest management.

Superintendents must ensure that the park IPM coordinator reviews and obtains required reviews and approvals for all pesticide projects performed within the park, including projects performed by non-NPS employees such as lessees and contractors. Superintendents must also ensure that all pesticide applications are supervised by a certified pesticide applicator. Superintendents should encourage and support regular training for all applicators to ensure they are up to date on new technology and state regulations.

The superintendent must ensure that certification requirements established by the FIFRA or the state are met by park employees applying or supervising the application of pesticides in the park.

II. Park IPM Coordinator

Park IPM coordinators must have a firm understanding of the principles and practices of IPM and must be fully aware of the breadth of their responsibility within the park. The multifaceted nature of many pest management issues necessitates that the coordinator's purview not be restricted by organizational structure. As park coordinator, the individual is the focal point of all activities directly or indirectly related to pest management, including maintenance, resource management, interpretation, planning and design, management of concessions and special use permits, etc. Information exchange among these groups is a major responsibility of the park IPM coordinator, who should provide continuing education to park staff about IPM techniques.

In order to minimize reactive management decisions, the park coordinator should anticipate pest management problems. All existing and potential pest problems that may affect park resources should be determined. A survey program for potential pests and monitoring procedures for existing pests should be developed and implemented by the park coordinator.

Pesticide projects originate with park staff. The park IPM coordinator provides the first of three levels of review (park, region, and Washington Office) required for all pesticide projects before final approval may be granted by the Servicewide IPM Coordinator. Park coordinators should recognize that they are in the best position to provide the closest level of scrutiny, and to respond to questions and concerns raised by the regional and Servicewide IPM coordinators.

Park coordinators must attend the 40-hour NPS IPM course. They should also ensure that others applying restricted use pesticides in the park are working under the direct supervision of a certified applicator.

The park coordinator is the regional IPM coordinator's contact in the park. In this capacity, the park coordinator ensures that all Pest Management Program Reports (Form 10-21As), phone requests, and Pesticide Use Logs, including determining the pounds of active ingredients applied for each project, are completed, are accurate, and are submitted in a timely manner. The park coordinator keeps the superintendent abreast of all pest management issues and pesticide use.

The significance of the park coordinator's responsibility should be acknowledged by inclusion of the responsibility as a Critical Element in the employee's Performance Standards.

III. Regional IPM Coordinator

The **regional IPM coordinator** is the focal point for all pest management issues in the region. In this capacity, the regional coordinator implements the NPS IPM program on behalf of the Regional Director and represents the region on pest management issues.

Regional coordinators must be thoroughly familiar with the principles and practices of IPM and must have a good understanding of pesticide toxicity and mode of action. They should constantly be aware of pest management developments relevant to the pests within their regions.

Regional coordinators ensure that park personnel are kept abreast of policy and developments in pest management, pesticides, and pesticide safety. They should develop contacts among pest management professionals throughout their geographic regional area of responsibility so that regionally relevant guidance can be obtained on specific issues.

When necessary, the regional IPM coordinator visits the parks and works with the park coordinator in identifying pest problems and in developing management strategies. The regional coordinator also sponsors training in critical areas affecting pest management. When specific issues require study, the regional coordinators should seek the concurrence and support of other parks and regions in developing proposals for research and case studies.

The regional IPM coordinator consults with the regional curator on all IPM actions relevant to museum collections.

The regional coordinator provides liaison between park IPM coordinators and the Servicewide IPM Coordinator. In exercising the second level of review for pesticide projects, the regional coordinator ensures that the proposed pesticide use is an essential tactic within an appropriate IPM strategy.

The regional IPM coordinator is responsible for all pesticide reporting. Pesticide requests must be relayed to the Washington Office in a timely manner and each request must be supported by a Pest Management Program Report (Form 10-21A). The regional coordinator checks and summarizes the parks' Pesticide Use Logs at the end of the calendar year. The regional Pesticide Use Summary is forwarded to the Servicewide Coordinator. In addition to the pesticide use records, the regional coordinator is responsible for maintaining records of Pesticide Applicator Certification and for notifying applicators when and where recertification training and testing can be obtained.

The regional coordinator, because he/she provides consultation and makes recommendations regarding pesticide use, should be a certified pesticide applicator in at least one state in his/her

region and maintain certification by fulfilling the recertification requirements. The level of responsibility and the considerable skill, training, and effort the position requires, justify inclusion of the responsibility as a Critical Element in the employee's Performance Standards.

IV. Servicewide IPM Coordinator

On behalf of the Director, the **Servicewide IPM Coordinator** in the Washington Office is the principal leader of the NPS IPM program. With the advice and concurrence of the regional IPM coordinators, the Servicewide IPM Coordinator formulates and recommends Servicewide IPM and pesticide policy.

As the focal point for all of the Service's pest management activities, the Servicewide IPM Coordinator has the broad perspective of pest management issues. He or she is thus able to ascertain Servicewide priorities and link parks and individuals with similar experiences and problems.

The Servicewide IPM Coordinator must remain current on all IPM technology relevant to the myriad of pests managed throughout the National Park System and assure that this information is disseminated to the regional coordinators. Currency is maintained through professional contacts and through participation in pest management forums, interagency committees, and professional meetings.

The dynamic nature of IPM requires that the Servicewide IPM Coordinator identify workshops, training courses, and research to address major pest management issues, particularly issues that are multi-regional in scope. Research may range from basic studies on the biology of pests to case study demonstrations.

Whenever it is apparent that training is required to facilitate the implementation of IPM technology, the Servicewide IPM Coordinator will identify, develop, and coordinate with the Employee Development Division in implementing necessary training programs. Training, essential to the certification and recertification of Pesticide Applicators, is a major responsibility of the Servicewide Coordinator.

As the third and final tier in the review process, the Servicewide IPM Coordinator, on behalf of the Director, is the only authority that can grant approval for the use of pesticides on NPS lands.

The Servicewide IPM Coordinator must, through review of the Pest Management Program Report (Form 10-21A) and, when necessary, consultation with the regional IPM coordinator, determine that the pesticide is the only option or an essential element in an IPM strategy. When necessary, the Servicewide IPM Coordinator will recommend alternative tactics including alternative pesticides. The immediacy of many projects requires that pesticide requests be reviewed and acted upon in a timely manner.

The Service's pesticide use records are the responsibility of the Servicewide IPM Coordinator. Annual Pesticide Use Logs submitted by the regions are compiled by the Coordinator and specific inquiries regarding pesticide use, such as products and pounds applied, areas and acreage treated, are addressed by the Coordinator on behalf of the Director.

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Olkowski, W., and H. Olkowski. 1983. Integrated Pest Management for Park Managers, A Training Manual. John Muir Institute, Napa, California. Prepared under contract #CS-3000-0-0036-MO #3 from the National Park Service and United States Environmental Protection Agency.

Metcalf, R. L., and W. H. Luckmann, eds. 1982. Introduction to Insect Pest Management, second edition. John Wiley and Sons, New York.

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REPORT FORMS AND INSTRUCTIONS - EXHIBIT 1

I. Pest Management Program Report (Form 10-21A)

All requests for pesticide use require the submission of this form. This may be submitted using the attached form (see end of Exhibit 1) routed through the regional coordinator or through the PESTS module of COMMON. Each item must be completed in accordance with the following instructions. A new Form 10-21A must be submitted for each project annually, even if the project has been approved in previous years.

1) TARGET PEST: List the common name (and scientific name where possible) of the pest(s) to be managed. Also specify the life stage of the pest to be managed (e.g., egg, immature, adult, pre-emergent, post-emergent, flowering, pre-seed, mature, dormant, stump, etc.).

2) PRODUCT NAME: List the complete trade name of the product as it appears on the label. Also list the manufacturer (e.g., Sevin FR (Union Carbide), Garlon 4 (Dow)).

3) EPA REGISTRATION #: An EPA registration number appears on the label of every registered pesticide. Copy the number, which should always contain at least two sets of numbers separated by at least one hyphen, exactly as listed on the label. The first set of numbers may contain as many as six digits, while the second may contain up to five (e.g., 464-360, 19713-11g, 228-139-2993). Letters referring to state registrations may follow the numbers (e.g., 464-360 FL). However, do not confuse the above numbers with the EPA establishment number, which is used to identify pesticide manufacturing facilities. Most labels list establishment numbers, as well. They can be recognized as a number followed by the state abbreviation and another number (e.g., EPA Est. 100-LA-123). Do not list establishment number on the 10-21A.

4) ACTIVE INGREDIENT: List the active ingredient(s) in the product by its/their approved common name(s) (e.g., carbaryl, triclopyr). If the common name is not available, use the chemical name (e.g., O-O-Diethyl O-(3,5,6-trichloro-2-pyridyl)-phosphorothio-ate).

5) % or #/G/ACTIVE INGREDIENT: If the pesticide is in powdered/solid form list the percentage (%) of the active ingredient. If the pesticide is in liquid form list the pounds per gallon (#/G) of active ingredient as it appears on the label.

6) MIX OF PRODUCT WITH DILUENT: Give the amount of product to be mixed with diluent (e.g., 3 lbs of Carbaryl 50W mixed with 100 gallons of water, or 3 tablespoons of Garlon 3A mixed with 1 gallon of diesel oil.)

7) PRODUCT USAGE RATE: Give the amount of product to be used per unit treated. Examples of units include acre, cubic feet, linear feet, square feet, animal, burrow, and plant.

Example: If a 5 lb. package of a pesticide dust formulation is applied to 5 acres of turf, write "1 lb./acre."

8) PRODUCT AMOUNT USED PER APPLICATION: List the exact product amount to be used per application.

Example: If three one-pint bottles of 50 percent malathion are to be used per application, write "3 pints."

9) METHOD OF TREATMENT: List the equipment to be used for pesticide application (e.g., aerosol can, bait station, direct application, dust gun, fogger, helicopter, hand placement, hand pressure sprayer, mist blower, rodding and trenching, tent fumigation, wick applicator, etc.).

10) FORM APPLIED: List how the product is formulated (e.g., bait, dust, emulsifiable concentrate, granules, liquid, suspension, wettable powder, etc.).

11) AREA OR UNITS TO BE TREATED: Give actual area that you are proposing to treat.

Example: If you are broadcast treating 3 acres of turf, write "3 acres-broadcast treatment."

Example: If you are spot treating 6 trees on 4 acres of turf, write "6 trees on 4 acres-spot treatment."

12) MANAGEMENT ZONE: List either Historic, Natural, Cultural, or Special Use.

13) NUMBER OF SITES: List the number of sites to be treated.

14) DESCRIPTION OF SITES: Give a brief description of the sites to be treated (e.g., cherry trees, structures, native prairie). Also include the management zone (natural, historic, development, or special use).

15) NO. OF APPLICATIONS: List the number of times that you expect to apply the dosage of pesticide described above.

16) AMT. PRODUCT USED TOTAL: List the total amount of product to be used for the entire project (equals product amount used per application times number of

applications. Do not include the diluent in this calculation; e.g., water, vegetable oil, etc.)

17) REGION: List the National Park Service region to which your park reports.

18) YEAR: List the calendar year for which the project is proposed.

19) ORGANIZATION: List the official name of the park.

20) PROJECT: List the official four-letter organization code, the last two digits of the calendar year, and a unique number assigned to the project, preferably by the park (separated by hyphens). An example is "YELL-84-01" for project number 1 in 1984 at Yellowstone National Park. If using Common, omit the year; e.g., YELL-01.

21) PURPOSE: Describe the purpose of the project.

Some examples are:

Crop (name) protection
Employee safety
Endangered species protection
Exotic plant control
Forest Insect and Disease Project
Greenhouse plant protection
Historical preservation
Household protection
Lawn and turf protection
Livestock protection
Museum specimen protection
Orchard protection
Ornamental protection
Pasture protection
Public health protection
Quarantine
Agricultural research
Roadside and trail maintenance
Site protection and restoration
Soil sterilization
Structural protection
Utility right-of-way clearance

22) SEASON OR PERIOD OF APPLICATION: Use either months or seasons to complete this category. If possible, give exact dates.

23) AREAS TO BE AVOIDED: List any areas which should be avoided as indicated on the label or in the product literature (labeling).

24) AREAS TO BE TREATED WITH CAUTION: List any areas that should be treated with caution, as specified on the label or in the product literature (labeling).

25) PRECAUTIONS: List any and all precautions such as extra safety procedures needed, as prescribed on the label, or in the product literature (labeling). Specify whether cartridge or dust mask type respirator is to be used.

26) USE OF TRAINED OR CERTIFIED PERSONNEL: Specify the name of certified pesticide applicators (include specific federal or state applicator program and certification category) and uncertified applicators involved in the project.

27) MONITORING: List any planned monitoring activities, both pre- and post- treatment. Briefly describe method. List any thresholds that have been established.

28) PERSON TO CONTACT: List the name and phone number of the park IPM coordinator. He/she should be able to answer technical questions about the project.

29) OTHER REMARKS: Include any comments which you feel are necessary to clarify any of the preceding items. List any nonchemical alternatives which have been considered as possible solutions to the problem and give reasons for their rejection. Give reasons for the importance of this project, such as damage or destruction of resources or threats to safety which could occur if management operations were not accomplished. Attach additional description of project as needed.

II. USDI PESTICIDE USE PROPOSAL

This form is to be submitted for all projects which require Departmental review. In addition, enclose a 10-21A and a legible copy of a current label (including any special use patterns for the state where the chemical will be applied). Projects requiring DOI review should be submitted to the Washington Office IPM Coordinator at least two months prior to the application date. Projects requiring DOI review may not be submitted via the PESTS module of COMMON. Departmental review is required for the following types of projects:

1. all pesticide uses classified as Restricted by EPA; check with the regional IPM coordinator for the most recent listing,

2. pesticide uses that involve aquatic application or when the applied pesticide could reasonably be expected to get into water areas,

3. pesticide uses that can be expected to affect threatened or endangered animal or plant species,

4. pesticide uses that consist of one application of more than 2,560 acres.

Directions for Completing DOI Pesticide Use Proposal:

1) PROPOSAL NUMBER: This number should be the same as the project number listed on the 10-21A (e.g., YELL-84-01).

2) BUREAU: National Park Service.

3) STATE/COUNTY: List the state(s) and county(ies) where use of the chemical is proposed.

4) DATE: Date the proposal was prepared.

5) AREA: The name of the park where the chemical will be applied (e.g., Yellowstone NP).

6) TRADE NAME: Trade name of the chemical (e.g., Rodeo).

7) EPA REGISTRATION NUMBER: The Environmental Protection Agency registration number of the chemical to be used (e.g., 345-209). (Do not confuse this with the EPA establishment number, which identifies the manufacturer, not the pesticide. The EPA establishment number will be preceded by the letters EPA EST.)

8) COMMON NAME: Common name of the proposed chemical (e.g., glyphosate).

9) MANUFACTURER: Firm producing the chemical.

10) FORMULATION: The physical or chemical nature of the compound (e.g., wettable powder, solution, dust, granules, emulsifiable concentrate, etc.).

11) APPLICATION DATE(S): The date or dates the material will be applied (e.g., April-May, 1986, July 15, 1986; do not use Spring, Fall, etc.).

12) METHOD OF APPLICATION: Method used to disperse the chemical (e.g., cut stump, backpack sprayer, hydraulic sprayer, aerial, etc.).

13) NUMBER OF APPLICATIONS: How many times the material may be applied (e.g., 6 times, once per month for 3 months, or list action thresholds; do not use "as needed").

14) APPLICATION RATE: List rates and units specified on label (e.g., 0.05 lbs. of active ingredient per acre).

15) PEST: Provide specific information about pest(s) and reason for application (e.g., kudzu, Japanese honeysuckle; to manage exotic vegetation and restore native prairie).

16) TREATMENT SITE: Provide specific information about area (e.g., "15 acres along 3 miles of Route 28 beginning at park entrance," "road banks on steeply sloped site and soil is silty loam"). Also, since groundwater contamination is a concern when using

pesticides, especially herbicides used on crops, indicate the average depth to groundwater. If this information is not known, state so on the form.

17) SENSITIVE ASPECTS AND PRECAUTIONS: Do not list precautions listed on the label. Instead, list precautions that will be taken to protect sensitive aspects if they are present (e.g., the chemical will be applied when sensitive species are dormant or after they have set seed, etc.). If threatened or endangered species are involved, include the results of your consultation with the U.S. Fish and Wildlife Service, in compliance with Section 7 of the Endangered Species Act.

18) SIGNED: Signature of individual responsible for the project.

19) PHONE/DATE: Provide the commercial and FTS numbers of the individual responsible for the project and date the form was signed.

20) Remainder of form to be completed by Washington Office or Department.

III. Pesticide Use Log

A Pesticide Use Log must be maintained for each park. This should consist of a loose-leaf binder containing forms as illustrated at the end of Exhibit 1. Original copies of these forms may be obtained from the regional or Servicewide IPM Coordinator and then photocopied at the park. The Pesticide Use Log may be maintained using the COMMON data base if an approved 10-21A has been entered in COMMON for that project.

Each park should maintain a running account of actual pesticide use by making an entry on the form immediately following each pesticide application. These entries may be legibly handwritten. This will require submission of the needed information from special use permittees, contractors, concessioners, etc. Proper maintenance of this log will facilitate retrieval of the pesticide use information necessary for year-end reporting. Pesticide Use Logs covering the entire calendar year will be due in the Washington Office on February 1 of the succeeding year.

Each log sheet contains enough space for fourteen entries. Keep a separate page for each project, especially when the pesticide will be applied more than one time in a year. It may be helpful to copy the approved 10-21A on the back of the appropriate log page to assist in record keeping and to keep applicators informed of important application information. See instructions below for completing the form. This form may be expanded to meet additional local reporting requirements. Anyone having difficulty with the requested calculations may contact their regional IPM coordinator for assistance.

1) PARK: List the official name of the park.

2) PROJECT NO.: List the four-letter organization code for the park and the sequential project number (e.g., YELL- 84-02).

3) REGION: List the regional Office to which the park reports.

4) YEAR: List the calendar year for which the listed projects are covered. D0 NOT USE SAME SHEET FOR MORE THAN ONE CALENDAR YEAR.

5) DATE APPLIED: List the date that the application was performed. If a project takes more than one day, make separate listings for each day of application.

6) APPLICATOR: List the name of the applicator(s) who are actually applying the pesticides. This includes contract pest control operators, special use permittees, etc. Include the number on certified pesticide applicator license or add Certified Applicator: (Name) or Contracted Firm: (Name)

7) TRADE NAME: List the trade name of the pesticide that appears on the label (e.g., Dursban TC).

8) ACTIVE INGREDIENT: List the common name of one of the active ingredients in the product (e.g., chlorpyrifos).

9) EPA REGISTRATION NUMBER: List the complete EPA registration number for the product.

10) PEST: List the target pest(s) which were treated for each application.

11) AMOUNT OF UNDILUTED PRODUCT: State the actual amount of undiluted product applied.

Example: If two 1-pint bottles of 22.5 percent chlorpyrifos solution was used then list "2 pints."

12) AREA TREATED: State the total area treated in square feet, linear feet, acres, or other appropriate units.

Example: If two acres of weeds were broadcast with glyphosate, then state " 2 acres--broadcast."

If 15 trees in an area of 30 acres were spot treated, state: "15 trees on 30 acres--spot treated."

If 3 seasonal employees used insect repellent, state: "3 employees."

Calculate Pounds of Active Ingredient:

Complete the following section at the end of the calendar year and only once for each project (i.e., if a project fills up more than one page, do this section only on the last page for each project).

13) ACTIVE INGREDIENT(S): List all active ingredients given on the product label.

14) TOTAL UNDILUTED PRODUCT: Total the AMOUNT UNDILUTED PRODUCT column from the top part of the form. If a project fills up more than one page, total AMOUNT UNDILUTED PRODUCT column for all pages of that project. Convert this to pounds for solids and gallons for liquids. See instructions for calculating Pounds of Active Ingredient below.

15) CONVERSION CONSTANT: For solid products this will consist of the percentage of each active ingredient. For liquid products this will consist of the pounds per gallon of each active ingredient, OR the percentage of each active ingredient times the specific gravity of the product times the weight of water (8.34 pounds per gallon). This will be different for each active ingredient. See instructions for calculating Pounds of Active Ingredient below.

16) POUNDS OF ACTIVE INGREDIENT: This is the value calculated by multiplying the TOTAL UNDILUTED PRODUCT column by the CONVERSION CONSTANT column.

A. Calculating Pounds of Active Ingredient

In order to calculate pounds of active ingredient, information from the product label and sometimes the Material Safety Data Sheet (MSDS) will be needed. (For the most current label and MSDS, contact the manufacturers. For a solid product the active ingredient(s) (AI) and percentage(s) of the AI(s) must be known. For a liquid product the AI(s) and either 1) how many pounds of AI are in a gallon of product (sometimes found on the label), or 2) the percentage of each AI (on the label and MSDS) and the specific gravity of the product (on the MSDS) must be known. Note that each product has a unique specific gravity. Calculate the pounds of 100% active ingredient for each

AI listed on the label. For some products this information is available through the COMMON data base.

The other information needed is **how much product** was used. This is recorded in "amount of product" column on the Pesticide Use Log. The amount of water or other carrier added does not need to be recorded unless the carrier is a chemical registered with the EPA.

If a pesticide is to be applied more than one time for any project, the amounts used for that project should be added together (from the "amount of product" column) and the amount of active ingredient calculated from the total amount of product. It is not necessary to calculate amount of 100% active ingredient for each separate application. Projects should be kept on separate log sheets when more than one use per project is anticipated, or a summary sheet submitted at the end of the year with these "project totals."

Report all calculations to two decimal places. Make a note if calculations reveal a value lower than 0.01 pounds. The Servicewide IPM Coordinator will decide whether or not the figure will be retained.

Calculations

For a Solid (powder, dust, solid, gel or wax)

1. If the usage is reported in ounces, convert the ounces (oz) of product used to pounds (lbs) (16 ounces = 1 pound). To do this, divide ounces used by 16.

   Example: 12 oz = 12/16 = 0.75 lbs
   120 oz = 120/16 = 7.5 lbs

2. Determine how much of the weight of the product is active ingredient (amount 100% AI). To do this, multiply by percent AI for each AI.

   Example: A product contains 75% boric acid and 10% silica gel. The park applied 1.5 pounds of the product.

   Boric Acid: 1.5 lbs X 0.75 = 1.13 lbs
   Silica Gel: 1.5 lbs X 0.10 = 0.15 lbs

   NOTE: The total of boric acid and silica gel is 1.28 lbs (less than the 1.5 lbs of product). This is because 15% of this product is "inert."

Sprays

Determine if the product has been measured in fluid ounces or dry weight. If it is measured as dry weight, this will usually be indicated by the words "net weight"; handle the calculation as shown above. If measured in fluid ounces, calculate as below. (Liquids are usually measured in fluid ounces.)

Liquids

1. Convert the fluid ounces (fl. oz.) of product used to gallons (gallon)(128 fl. oz. = 1 gallon). To do this, divide fluid ounces used by 128.

   Example: 32 fl. oz. = 32/128 = 0.25 gallon
   224 fl. oz. = 224/128 = 1.75 gallon

   OR convert cups, pints, quarts, half gallons to gallons.

   16 cups = 8 pints = 4 quarts = 2 half gallons = 1 gallon

   Example: 8 cups = 8/16 = 0.5 gallon
   3 quarts = 3/4 = 0.75 gallon

   OR convert teaspoons (t) or tablespoons (T) to fluid ounces, then to gallons.

   3 teaspoons = 1 tablespoon = 0.5 fl. oz. = 0.0039 gallon

   Example: 45 t = 15 T = 7.5 fl. oz. = .06 gallon

2a. If pounds per gallon are known, the calculation is similar to that for solids. Multiply the gallons used times pounds per gallon to get pounds (amount 100% AI).

   Example: The herbicide Roundup is 41% glyphosate. The label indicates that there are 3 pounds/gallon glyphosate (acid equivalent, see Miscellaneous Notes, below). The park applied 8.6 gallons of undiluted Roundup. Therefore,

   Glyphosate: 8.6 gallon X 3 lbs./gallon = 25.8 lbs.

   NOTE: When pounds per gallon are given, ignore the percentage AI.

   However, when there is more than one AI, the label rarely gives pounds per gallon for more than one AI (exceptions do occur). In this case, check COMMON to see if that information is available.

Example: The insecticide Dursban 2E lists 22.4% chlorpyrifos and 42.1% petroleum distillate as active ingredients. The park used 6.75 undiluted gallons. According to the data in COMMON, there are 2.0 pounds per gallon of chlorpyrifos and 3.76 pounds per gallon of petroleum distillate in this product. Therefore,

Chlorpyrifos: 6.75 gallon X 2.0 lbs./gallon = 13.5 lbs.
Petroleum distillate: 6.75 gallon X 3.76 lbs./gallon = 25.38 lbs.

2b. If pounds per gallon are not known, use percent active ingredient, the specific gravity of the product (compares the mass of a volume of the product to the mass of the same volume of water), and the weight of water (8.34 pounds per gallon).

Step 1. Calculate a Conversion Constant for each active ingredient in the product. Do this by multiplying the percentage of each active ingredient by the specific gravity of the product and by 8.34. This gives the pounds per gallon of that particular active ingredient.

Step 2. To calculate the weight of each AI used (Pounds of Active Ingredient), multiply the Conversion Constant for each active ingredient by the Total Undiluted Product.

Example: The wood preservative, Jasco Termin - 8, contains 25% copper naphthenate and 75% petroleum distillate. The specific gravity is 0.828. The park used 3.5 undiluted gallons of wood preservative.

First find the Conversion Constant for each active ingredient.

Copper naphthenate: 0.25 X 0.828 X 8.34 lbs/gal = 1.73 lbs/gal
Petroleum distillate: 0.75 X 0.828 X 8.34 lbs/gal = 5.18lbs/gal

NOTE: Most products have specific gravities near or less than one; occasionally a product's specific gravity is greater than one.

Finally, calculate the Pounds of Active Ingredient for each active ingredient.

Copper naphthenate: 3.5 gal X 1.73 lbs/gal = 6.06 lbs
Petroleum distillate: 3.5 gal X 5.18 lbs/gal = 18.13 lbs

Miscellaneous Notes

For many herbicides, the label will give a percentage of the salt of the chemical as the main part of the label. Then below this is given the percentage of the "acid equivalent" and sometimes the pounds per gallon of this "acid equivalent." Use the acid equivalent values. At this time the "salt"

portion is not considered a part of the weight of the active ingredient and is inactive. (See example of label on following page.)

TRIMEC LABEL

KILLS: Dandelion, Chickweed, Knotweed, Plantains, Henbit, Spurge, Kudzu and many other species of broadleaf weeds; some of which are listed on this label.

YOUR GUARANTEE OF A TRIMEC® COMPLEX PROFESSIONAL QUALITY ®

ACTIVE INGREDIENTS:

*Dimethylamine Salt of 2,4-Dichlorophenoxyacetic acid	25.93%
**Dimethylamine Salt of 2-(2-methyl-4-chlorophenoxy) propionic acid	13.85%
***Dimethylamine Salt of Dicamba (3,6-dichloro-o-anisic acid)	2.76%
INERT INGREDIENTS	57.46%
	TOTAL 100.00%

THIS PRODUCT CONTAINS:

*2.03 lbs. 2,4-Dichlorophenoxyacetic acid per gallon or 21.54%.
**1.08 lbs. 2-(2-methyl-4-chlorophenoxy) propionic acid per gallon or 11.45%
***0.21 lb. 3,6-dichloro-o-anisic acid per gallon or 2.29%.
*Isomer Specific by AOAC Method.

To obtain needed information, call the chemical companies and ask for the "Technical Information Branch." This information is available to the public. Labels and MSDS should be free, especially if you are using or are planning to use their products. The Washington Office also maintains an extensive label and MSDS file, as do some regional coordinators.

When using an old product for the last time, make sure you have a copy of the label before disposing of the container. Sometimes it is difficult to get information about old products.

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
PEST MANAGEMENT PROGRAM REPORT

TARGET PEST:

PRODUCT NAME:

EPA REG. #:

ACTIVE INGREDIENT:

% OR #/G (/)
ACTIVE INGREDIENT:

MIX OF PRODUCE
WITH DILUENT:

PRODUCT USAGE RATE:

PRODUCT AMOUNT USED
PER APPLICATION:

METHOD OF TREATMENT:

FORM APPLIED:

AREA OR UNITS
TO BE TREATED:

MANAGEMENT ZONE:

NUMBER OF SITES:

DESCRIPTION OF SITES:

NO. OF APPLICATIONS:

AMT. PRODUCT USED TOT:

REGION:
YEAR:
ORGANIZATION:
PROJECT:
(e.g., YELL-84-01)

PURPOSE:

SEASON OR PERIOD
OF APPLICATION:

AREAS TO BE AVOIDED:

AREAS TO BE TREATED
WITH CAUTION:

PRECAUTIONS:

USE OF TRAINED OR
CERTIFIED PERSONNEL:

MONITORING:

PERSON TO CONTACT:

OTHER REMARKS:

SIGNATURES OF APPROVAL

PARK: _____ DATE: _____

REGION: _____ DATE: _____

PESTICIDE USE PROPOSAL

Proposal
Number _____

U. S. Department of the Interior
Pesticide Use Proposal

BUREAU _____ STATE _____ COUNTY _____ DATE _____

AREA _____ (____)

I. **Pesticide/Application:**

TRADE NAME _____ EPA REGISTRATION # _____

COMMON NAME _____ MANUFACTURER _____

FORMULATION _____ APPLICATION DATE(S) _____

METHOD OF APPLICATION _____ # OF APPLICATIONS _____

APPLICATION RATE (use units on label) _____

II. **Pest:** List specific pests, crop, and reason for application.

III. **Treatment site:** Describe land type or use, size or volume, timing of application, slope and soil type, if relevant.

IV. **Sensitive aspects and precautions:** Describe sensitive areas (e.g., marsh, endangered species habitat) and distance to treatment site. If sensitive area is upstream or beyond one mile from site, indicate "no sensitive areas nearby." List measures to be taken to avoid impact to sensitive areas.

I will ensure that the pesticide will be applied in accordance with label restrictions and the information above.

Signed _____ Phone _____ Date _____

Bureau Approval _____ Date _____

Bureau Recommendations

Departmental Recommendations

____ Approved
____ Disapproved
____ Approved with modifications

_____ Date _____
Director, Office of
Environmental Project Review

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
PESTICIDE USE LOG

PARK: SAMPLE PARK
PROJECT NUMBER: SAPA001

REGION: EASTERN
YEAR: 1991

DATE APPLIED	APPLI-CATOR	TRADE NAME	ACTIVE INGREDIENT	EPA REG. NUMBER	PEST	AMT.UNDIL PRODUCT	AREA TREATED
2/25/91	J.Smith	Termin-8	CopperNapth	7424-1	Wood Decay	1.0 gal	100 sqft
3/22/91	M.Davis	"	"	"	"	0.5 gal	50 sqft
4/05/91	B.Mathews	"	"	"	"	1.2 gal	120 sqft
4/15/91	M.Davis	"	"	"	"	0.8 gal	90 sqft
					TOTAL	3.5 gal	360 sqft

CALCULATE POUNDS OF ACTIVE INGREDIENT: TOTAL UNDILUTED PRODUCT x CONVERSION CONSTANT

ACTIVE INGREDIENT(S)	TOTAL UNDILUTED PRODUCT	CONVERSION CONSTANT	POUNDS OF ACTIVE INGREDIENT
CopperNaphtena	3.5 gal	1.73 lbs/gal	6.06 lbs
PetroleumDisti	3.5 gal	5.18 lbs/gal	18.13 lbs

CONTRACT PERFORMANCE SPECIFICATIONS - EXHIBIT 2

I. Introduction

Although the following contract specifications were developed for use in NPS facilities, many of the specifications can be used for other pest management situations.

A. General Program Description

It is the intent of this contract to provide a comprehensive Integrated Pest Management (IPM) program for the federal premises listed herein.

Pest management, as traditionally contracted by the federal government in the past, is largely reactive to pest infestations and bases much of its response on the routine, scheduled spraying of pesticides. This spraying is often done in locations remote from the centers of pest populations, with limited effectiveness in providing adequate control.

Conversely, IPM is a process, or planned program, for long term pest suppression. The process is based on surveillance and the interpretation of data to estimate pest population in a given area. This monitoring allows for accurate decisions to be made on when management measures are needed, the type of control measures selected, and the method of application. Control practices in an IPM program must extend beyond the application of pesticides to include structural and procedural modifications which establish physical barriers to pests, and reduce the food, water, and harborage available to them.

The contractor shall furnish all labor, materials, and equipment to implement the surveillance, trapping, and pesticide application aspects of the IPM program. The contractor shall also make detailed, site-specific recommendations for structural and procedural modifications to achieve pest suppression. The contractor shall provide evidence in his proposal of sufficient expertise in entomology, pest management, and IPM principles and practices to effectively carry out these responsibilities.

The [specify park and NPS employee who will serve as the contact person in the park] will act as the government's quality assurance manager for the IPM contract.

B. Pests Included and Excluded

The IPM program specified by this contract is intended to suppress populations of [specify pest or pests to be managed (e.g., rats, mice, cockroaches, ants, silverfish)]. Populations of these pests which are located outside the buildings listed herein, are excluded. All Concessions Space within the buildings listed herein is excluded from this contract. [Concessioners are responsible for contracting pest management activities for their spaces. However, they are required to follow NPS policies and procedures.]

The following pests are excluded from this contract: birds and all other vertebrates other than commensal rodents; termites and other wood-destroying organisms; mosquitoes; pests located outside buildings that primarily feed on outdoor vegetation.

II. General Program Requirements

General requirements of the IPM program shall include the following for each building specified in this contract:

A. Initial Inspection

A thorough, initial inspection shall be conducted during the first month of this contract by the contractor's staff entomologist or representative and the NPS employee described earlier or an alternate. The purpose of this initial inspection is for the contractor to evaluate the pest management needs of the premises and to discuss these needs with the NPS [fill in title]. The following specific points should be addressed:

1. identification of problem areas in and around the building,

2. identification of structural features or personnel practices that are contributing to pest infestations,

3. discussion of the effectiveness of previous control efforts,

4. facilitation of contractor access to all necessary areas. (If needed, access to building space shall be coordinated with the [NPS Representative]), and

5. informing the contractor of any restrictions or special safety precautions.

B. Submission of Plan

Following the initial inspection, the contractor will develop a detailed pest management plan and service schedule for each building. This written plan and schedule must be submitted to the [insert title of park person responsible for approving the plan], prior to initiation. The plan and schedule should address any structural or operational changes which might facilitate the pest management effort. In addition, the plan must identify the proposed primary pesticides and alternatives. These pesticides must be approved in advance by the National Park Service Servicewide IPM Coordinator. The plan must also identify method(s) of application proposed for use in or around the building and rationale for each type of use. Proposed trapping devices for rodents, if any, should also be included. The plan should describe in detail the contractor's methods for monitoring pest populations in and around the building.

Frequency of inspections and treatment by the contractor shall depend on the specific pest management needs of the premises. At the minimum, inspections shall be done monthly. Treatments will be made only when thresholds have been reached and the NPS has been consulted and concurs with proposed treatment.

The plan and schedule shall be submitted not more than [XX] working days following the initial inspection of the premises. The [title of responsible NPS person] will render a decision regarding the acceptability of the plan and schedule within [XX] working days following receipt. The contractor shall be on site to implement the plan and schedule within [XX] working days following notice of approval of the plan. If the plan is disapproved, the contractor shall have [XX] working days to submit a revised plan and schedule.

Any subsequent changes in the plan and schedule and/or additions to the approved pesticides must receive the concurrence of the NPS.

C. Monitoring and Inspection

A critical aspect of the pest management plan shall be the establishment of a monitoring and inspection program with written records to identify infested zones and allow an objective assessment of pest population levels. Monitoring and inspection shall be continued throughout the duration of this contract. The contractor shall describe in his proposal his approach to meeting this requirement.

D. Pesticide Treatment

The contractor shall not apply any pesticide which has not been specifically approved by the NPS.

As a general rule, application of pesticides in any area of the park, inside or outside of a structure (i.e., in any room, closet, hallway, stairwell, court, driveway, planting bed, and similar locations) shall not occur unless inspections or monitoring indicate the presence of pests in that specific area. For example, fresh rodent signs, droppings, active burrows or runway is sufficient to indicate the presence of rodents in an area.

While working in the park, the contractor must have in his possession a copy of the label of the approved pesticide. All mixing of pesticides will be done in the park. The mixing of pesticides will be from factory sealed containers brought to the park. It will be the responsibility of the contractor to dispose of any unused pesticides, or empty pesticide containers. The contractor will not dispose of any pesticides or pesticide residues within the park, unless the material (e.g., rinseates) can be applied to treated areas.

E. Structural Modifications

Structural modifications for pest suppression shall not be the responsibility of the contractor. However the contractor must identify structural modifications that will reduce pest populations and notify the National Park Service in writing on the monitoring form during the site visit.

F. Record Keeping

The contractor shall be responsible for maintaining a complete and accurate pest management log. Each building specified in this contract shall have its own log book which will be kept in the [specify where log books should be kept] and maintained on each visit by the contractor.

The log shall contain the following items:

1. A copy of the pest management plan and service schedule for the building.

2. A copy of the current label and EPA registration number for each approved pesticide used in the building, including the Material Safety Data Sheet.

3. Pest surveillance data sheets which record, in a systematic fashion, the number of pests or other indicators of pest population levels revealed by the contractor's monitoring program for the building (e.g., include number and location of cockroaches trapped, number and location of rodents trapped or carcasses removed, number and location of new rat burrows observed). In the proposal, the contractor shall provide a sample of the format for the data sheets and an explanation of all information to be recorded on them.

4. The location of all traps, trapping devices, and bait stations in or around the premises. This information can be in either tabular, list, or map format.

5. The contractor shall also report on the Pesticide Use Log report form the information concerning pesticide application (form provided by the National Park Service). The contractor also shall report arrival and departure time of the contractor's representative performing the service, and all information on pesticide application required on the Pesticide Use Log.

G. Special Requests and Emergency Service

The regular service shall consist of performing all components of an IPM program other than structural modifications, as described in the contractor's detailed plan and schedule for each building, during the period of this contract. Occasional requests for corrective action, special services beyond the routine requests, or emergency service, shall be placed with the contractor by the NPS representative. The contractor shall respond to requests for emergency service within

[XX] day(s) of the request. The contractor shall respond to special service requests within [XX] working day(s) after receipt of request. In the event that such services cannot be completed within the specified time frames, the contractor shall immediately notify the [NPS representative] and indicate an anticipated completion date.

III. Specific Program Requirements and Restrictions

A. License

The contractor must be licensed to perform pest management activities within the state(s) in which the treatment(s) will occur. The contractor must also provide proof of insurance to cover accidents, spills, misapplication, damage to resources, etc.

B. Personnel

The contractor shall provide, under this contract, only qualified pest management personnel with experience in the conduct of IPM programs. All personnel assigned to this contract by the contractor must understand current practices in this field and be able to make judgements regarding IPM techniques. Any substitutions, additions, or replacement of personnel from those cited in the contractor's original proposal must be submitted to the NPS for approval prior to starting work under this contract.

The contractor must meet the following specific staff requirements:

Entomologist

The contractor shall have, as a full-time employee, a staff entomologist who will have primary responsibility for the conduct of this contract and who will be available for routine and emergency consultation. The following minimal documentation regarding this individual's experience and training shall be provided in the proposal:

1. a resume,

2. a Bachelor's degree in entomology from an accredited university or a Bachelor's degree in biology, chemistry, or other life science, and

3. current certification in the appropriate category or categories of Commercial Pesticide Applicator, such as, in the category of Industrial, Institutional, Structural, and Health Related Pest Management with a minimum of subcategories to include General Pest Management and Rodent Management.

Designated Pest Management Technician

A pest management technician and an alternate must be identified in the proposal. These individuals will perform on-site pest management in accordance with this contract. The pest management technician shall assure safety and carry out coordination and continuity of the program. The pest management technician and alternate shall both have a working knowledge of this contract and the detailed pest management plan. The contractor shall provide, in the proposal, the names of all pest management personnel assigned to this contract, and pertinent information regarding their qualifications, experience, and training. Throughout the life of this contract, all personnel providing on-site pest management services must be certified in the appropriate pest management categories, such as, Industrial, Institutional, Structural, and Health Related Pest Management. No uncertified personnel will be permitted to apply pesticides on-site under this contract.

C. Manner and Time to Conduct Service

It shall be the contractor's responsibility to carry out work according to the detailed pest management plan and schedule developed for each building. The contractor's pest management technician shall be responsible for coordination with the [insert title of NPS person responsible] at the beginning of each visit. The purpose of this coordination is to review the plan and schedule, and to receive information on problem areas identified since the last visit.

Services which do not require that building occupants be absent during treatment may be performed during the regular hours of operation in the various buildings. When it is necessary to perform work on weekends or outside the regularly scheduled hours identified in the contractor's plan and schedule, the contractor shall notify the [insert title of NPS person] at least [XX] day(s) in advance and all arrangements will be coordinated between the [title NPS person] and contractor.

Where service to vacated areas is required, it shall be the contractor's responsibility to notify the NPS at least [XX] day(s) in advance of the treatment, provide and post all necessary signage, assure the security of the area treated, and remove signage when the area is safe for re-entry.

The contractor shall observe all safety precautions throughout the performance of this contract. Certain areas within some buildings may require special instructions for persons entering these areas. Any restrictions associated with these special areas will be explained to the contractor by the [title NPS person and other appropriate personnel]. These restrictions shall be adhered to and incorporated into the contractor's detailed plan and schedule for the building.

All persons employed under this contract shall be subject to government regulations as are applicable during the time spent on government property. Building passes if needed will be supplied by the government.

All contractor personnel, while working in or on government-owned or leased premises, shall wear distinctive uniform clothing. The uniform shall have the contractor's name easily identifiable, affixed thereon in a permanent or semipermanent manner. Additional personal protective equipment required for the safe performance of work must be determined and provided by the contractor. Protective clothing, equipment, and devices shall, at a minimum, conform to Occupational Safety and Health Administration (OSHA) standards for the products being used. Vehicles used by the contractor must be identified in accordance with state and local regulations.

D. Pesticide Products and Use

The contractor shall be responsible for the safe use of pesticides and their use according to the label. Any pesticide used by the contractor must be approved in advance by the National Park Service and be registered with the EPA and appropriate State and/or local jurisdiction. Transport, handling, and use of all pesticides shall be in strict accordance with the manufacturer's label instructions and all applicable federal, state, and local laws and regulations.
The environment and the public shall be protected at all times.

The contractor shall minimize the application of pesticides wherever possible. Techniques include:

1. the use of crack and crevice application of pesticide directly to pest harborage areas rather than fan spraying exposed surfaces in the general vicinity of harborage areas,

2. the use of containerized bait for cockroaches rather than sprays, and

3. pesticide fogs or space sprays (including mists and ultra-low volume applications) will be restricted to unique situations for which no other alternatives are available or feasible.

E. Rodent Control

Snap traps and trapping devices (including glueboards) used in rodent control must be checked daily. Rodents killed or trapped shall be disposed of daily by the contractor. Trapping shall not be performed during periods when maintenance will be delayed by holidays, weekends, etc. Traps shall be placed out of the general view and located so as not to be affected by routine cleaning procedures, or accessed by children, pets, or other nontarget animals.

All rodenticides, regardless of packaging, shall be placed either in locations not accessible to children, pets, wildlife, and domestic animals, or in EPA-approved tamper-resistant (often termed "tamper-proof") bait boxes. Frequency of bait box servicing shall depend upon the level of rodent infestation. All bait boxes shall be labeled, and dated at the time of installation and each servicing. All bait boxes shall be maintained in accordance with EPA regulations, with an emphasis on the safety of nontarget organisms. The following three points shall be strictly adhered to:

1. The lids of all bait boxes must be securely locked or fastened shut.

2. Bait must always be placed in the baffle-protected feeding chamber of the box and never in the runway of the box.

3. All bait boxes must be securely attached or anchored to the floor, ground, wall, etc., so that the box cannot be picked up or moved.

All traps, trapping devices, and bait boxes shall be accounted for, and their location recorded in the building log book; all shall be removed from the premises covered by this contract at its conclusion.

F. Government Inspection

Throughout the duration of this contract, the premises covered will be inspected periodically by government personnel to determine the effectiveness of the program and contractor compliance with the contract. Inspection results will be documented in writing and submitted to the contractor. The contractor shall promptly initiate actions to correct all deficiencies found.

It shall be the contractor's responsibility to furnish a supply of materials necessary for government personnel to inspect the interior of all rodent bait stations. These materials may include Allen Wrenches to loosen and retighten fasteners, keys to open locks, or replacement of self-locking plastic ties. Implements to cut plastic ties or seals are not included under this provision.

G. Related Services

The NPS reserves the right to negotiate with the contractor for the purchase of related pest management services not specifically covered herein, such as subterranean and structural extermination of termites and other wood-boring insects, and to add (or delete) buildings or parts of buildings to the contract.

IV. Bid Submittal

A. Pre-Bid Building Inspection

All prospective bidders shall conduct a thorough and complete inspection of the building or area prior to submitting their proposal.

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ENDANGERED, THREATENED, AND RARE SPECIES MANAGEMENT

Endangered and threatened plant and animal species present unique management challenges for the National Park Service. They require special management with single species priority within an ecosystem management concept. This section discusses NPS responsibilities in the management of endangered, threatened, and rare species, as well as candidate species, sensitive species, experimental populations, and critical habitat.

DEFINITIONS

Passages enclosed in quotes are taken directly from the Endangered Species Act, as amended.

Endangered species "...any species which is in danger of extinction throughout all or a significant portion of its range..."

Threatened species "...any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." (Also refers to the intermediate status of a former endangered species downlisted toward full recovery.)

Candidate species Those species under consideration for addition to the List of Endangered and Threatened Wildlife identified in Category 1 or 2 in the animal or plant notice of review. Substantial new information concerning any species identified in these categories could result in a reevaluation of the status of the species.

The Fish and Wildlife Service (FWS) produces two types of notices of review: vertebrate and invertebrate animals, and plants. These reviews are scheduled to be revised every other year.

> **Category 1 species** Species for which the FWS has substantial information to support the biological appropriateness of proposing to list as endangered or threatened. Proposals have not yet been issued because they have been precluded at present by other listing activities; proposals are anticipated.
>
> **Category 2 species** Species for which the FWS has information that indicates proposing to list as endangered or threatened is possibly appropriate, but conclusive data on biological vulnerability and threat are not currently available to support proposed rules. These species will not be proposed for listing unless further biological data become available. (The FWS hopes that this designation will encourage investigation of the status and vulnerability of these taxa and consideration of them in the course of environmental planning).
>
> **Category 3 species** Species that were once considered for listing as endangered or threatened but not currently receiving such consideration. Subcategory 3a comprises species

for which the FWS has persuasive evidence of extinction. Subcategory 3b comprises species that were once thought to be biological species or subspecies, but that are now not considered distinctive and do not meet the Act's legal definition of a species. Subcategory 3c comprises species that are now considered to be more abundant or widespread, and/or substantially less subject to identifiable threats, than previously thought. Substantial new information concerning any species identified in these subcategories could result in a reevaluation of the status of the subject species.

Critical habitat "(i) the specific areas within the geographical area occupied by the species...on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species...upon a determination by the Secretary that such areas are essential for the conservation of the species."

Experimental population Any population of an endangered or threatened species (including any offspring arising solely therefrom) artificially established outside the current range of the species when the Secretary determines that the release will further the conservation of such species and that such population is not considered essential to the continued existence of the species. This status does not require the designation of critical habitat. Experimental populations occurring in NPS areas are treated as threatened species.

Rare species Any species which is considered restricted and limited throughout all or a significant portion of its range. This designation does not necessarily imply that populations of the species are significantly reduced or threatened with reduction. No legally required federal protection is associated with this designation.

Recovery plan A plan required for each listed species and generated by a task force under the leadership of the FWS. The plan describes the specific management actions necessary to restore the threatened or endangered species to recovery status, including the estimated cost and time involved. The plan implementation is overseen by the FWS coordinator.

Sensitive species Any species or infraspecies not otherwise designated whose population characteristics warrant special management or more intensive monitoring. Considerations may include:

- local rarity of native species,
- whether or not the species is endemic to the park or local vicinity,
- the importance of the species to the park (as identified in park management objectives),
- whether the species is the subject of political concern or unusual public interest,

- the usefulness of the species as an indicator species,
- the vulnerability of the species to local population declines, and/or
- whether the species or its habitat is subject to human disturbance during critical portions of its life cycle.

Species "includes a subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature."

Recovery The state when the numbers of individuals or populations (recovery objectives) identified by the recovery team and documented in the recovery plan have been attained and/or the threats have been reduced such that the habitat is secure and the species no longer warrants treatment under the Act. As the populations recover partially, they may be **downlisted** from endangered to threatened status. At full recovery, they may be **delisted**. But even when delisted at full recovery, such populations will continue to be monitored for at least an additional five years.

Taking To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

POLICY AND PROGRAM OBJECTIVES

The NPS Management Policies prescribes management of endangered, threatened, and candidate species in conformance with the Endangered Species Act, recovery plans, and other related documents. Management Policies states:

> The National Park Service will identify and promote the conservation of all federally listed threatened, endangered, or candidate species within park boundaries and their critical habitats....The National Park Service also will identify all state and locally listed threatened, endangered, rare, declining, sensitive, or candidate species that are native to and present in the parks, and their critical habitats....All management actions for protection and perpetuation of special status species will be determined through the park's resource management plan. (4:11)

Management and monitoring programs should be coordinated with other state and federal agencies.

Major program objectives:

1. Inventory and monitor sensitive, candidate, and listed species. This includes mapping species' distribution in the park, identifying critical habitats (if any), and determining numbers of individuals, threats to the species, condition, and population trends.

2. Manage endangered, threatened, and candidate species, and their critical habitats, in conformance with the Endangered Species Act, recovery plans, and other appurtenant documents.

3. Ensure that park operations do not adversely impact endangered, threatened, candidate, or sensitive species and their critical habitats, within or outside the park.

4. To the extent possible, ensure that activities, projects, or programs outside the park do not adversely impact endangered, threatened, candidate, or sensitive species and their critical habitats within the park.

5. Integrate to the fullest extent possible park management actions with other federal, state, and private recovery efforts.

6. Ensure appropriate consideration of federal and state listed species and other special status species in all plans and NEPA documents.

7. Encourage NPS involvement on recovery teams as appropriate.

8. Design and implement research relevant to the preservation of candidate, rare, sensitive, and listed species.

9. Thoroughly document recovery actions and considerations.

AUTHORITIES

The following legislation, policies, and agreements provide the authority for NPS policies on management of threatened and endangered species: the Endangered Species Act; state-specific endangered species acts; other state wildlife statutes or agreements pursuant to Section 6, ESA; the Migratory Bird Conservation Act; the Fish and Wildlife Coordination Act; the Wild and Scenic Rivers Act; the Marine Mammal Protection Act; the Bald and Golden Eagles Protection Act; the Wilderness Act; the Convention on International Trade in Endangered Species; and maritime and other international agreements.

This section of the Guideline addresses related responsibilities of the Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS). The FWS normally takes lead Departmental responsibility for coordinating and implementing provisions of the Endangered Species Act for all listed endangered, threatened, and candidate species, particularly for all terrestrial plants and animals and freshwater aquatic species. However, for certain listed marine taxa such as Cetacea (all whales and porpoises) and most Pinnipeds (Steller sea lions, Hawaiian monk seals, etc.), the NMFS may play a very active role under provisions of both the Endangered Species Act (1973) and the Marine Mammal Protection Act (1972). For those marine species it is often a case of shared FWS\NMFS responsibilities, with NMFS frequently assuming the lead

role. In each instance discussed below, where the listed species in question is a whale or Pinniped, the term "FWS" might more accurately read "NMFS" or "NMFS and FWS." This is particularly true for any activity that may involve the "taking" of a marine mammal.

RELATIONSHIP TO OTHER GUIDANCE

Other guidance may be obtained from the legislation cited in Authorities, above, from NPS Management Policies, and from species recovery plans. Other related guidance is found in NPS-2, the Planning Process guideline; NPS-12, the Environmental Compliance guideline; NPS-18, the Fire Management guideline; NPS-20, the Federal Assistance and Interagency Agreement guideline; NPS-28, the Cultural Resources Management guideline; NPS-53, the Special Park Uses guideline; and NPS-9, the Law Enforcement guideline. Many other sections of this Guideline, including Chapter 2, Vegetation Management and Native Animal Management, also provide guidance.

PROGRAM GUIDANCE

I. General Guidance

A species may be listed as "...an endangered species or a threatened species because of any of the following factors:

(A) the present or threatened destruction, modification, or curtailment of its habitat or range;

(B) overutilization for commercial, recreational, scientific, or educational purposes;

(C) disease or predation;

(D) the inadequacy of existing regulatory mechanisms; or

(E) other natural or manmade factors affecting its continued existence." (Endangered Species Act, as amended, 16 USC 1533)

Note that the Endangered Species Act makes no distinction between natural and human causes of a species' status. If a species is endangered or threatened through natural processes the law still applies.

The goal of endangered and threatened species recovery efforts is generally to increase populations and secure sufficient, suitable habitat to "recover" the species to acceptable levels (i.e., pre-decline or some other designated level). Endangered and threatened species, therefore, cannot simply be preserved through general habitat protection; they must be actively managed for recovery. If we only continue to preserve, those species may simply continue to decline because their habitats may no longer be suitable for survival, reproduction, and recruitment.

Management affects the distribution, abundance, and ecological relationships of and among species. Whereas preservation can be accomplished by a zoo, botanical garden, or other non-natural refugium, the NPS's goal is the long-term preservation of species and their ecological role and function as part of a "natural ecosystem." It is, therefore, critical that ecological aspects of management prevail in dealing with threatened and endangered species. An understanding of factors limiting the distribution and abundance of the species of concern must be well understood and incorporated into any management action.

Management options must place highest priority on identifying and removing the threat of extinction. Hence downlisting the species from endangered to threatened status (partial recovery) or delisting (full recovery) are primary goals. As noted above (Definitions), experimental populations established in NPS areas are to be managed as threatened species.

Once a park or region enters into a recovery program for a threatened or endangered species, a judgment concerning that species has already been made--that the species' recovery is of great enough value to warrant exceptional actions in the management of that species, of certain areas, and other associated species. Such exceptional or aggressive actions require thorough planning and documentation. Such actions may be critical to the success of the recovery effort, even though these exceptional actions may be sensitive or controversial. These actions may result in temporary alteration of habitat, displacement of more common native species, or modifications of certain other park operations. If these actions are necessary for the success of recovery programs, they must be regarded as acceptable management alternatives.

Suspension of ongoing recovery efforts should be considered only after a thorough examination of the effects of that suspension on local and regional recovery efforts.

Permanent or temporary closures of selected areas are appropriate means of reducing or eliminating undesirable impacts associated with human use, even if such closures affect visitor use or park operations.

Sensitive information such as the location of endangered or threatened species should generally not be released unless the release of such information contributes to recovery of the species. Information included in any report may be subject to release if a Freedom of Information Act request is made.

II. Management of Endangered and Threatened Species

A. Planning

Management actions should be in accordance with approved recovery plans. Unless there are unusual circumstances, parks should adhere to recovery priorities identified in those recovery plans, although park recovery goals and objectives may go beyond that prescribed by the recovery plan.

For example, the park objective of maintenance of natural populations may result in park goals of higher population levels or wider distribution than that projected for downlisting or delisting within an area covered by the recovery plan. In these cases, it may be appropriate to continue or intensify park recovery efforts after goals of the recovery plan have been met.

All endangered and threatened species recovery efforts should be thoroughly evaluated and documented in resource management plans, park files and appropriate NEPA documents. Potential impacts on endangered and threatened species (especially impacts resulting from NPS operations), their habitats, and recovery efforts should be considered in all park plans, park development planning, and project reviews. On any project, the FWS should be consulted to determine if there are any endangered or threatened species in the area. (See Consultation under Section 7 of the Endangered Species Act, below.) Prevention of extinction or extirpation, population and habitat inventory, protection of suitable or critical habitats, and monitoring will usually be the highest-priority activities. Special rules have been issued governing bald eagles and several species of sea turtles (see 50 CFR 17.41-2).

B. Manipulative Activities

Manipulative activities such as habitat or species restoration or population augmentation are encouraged if identified as appropriate in the recovery plan and if such activities would result in a more representative distribution of the species within the park. In considering any manipulative activities, the superintendent must consider potential impacts on other native species and park operations. If, however, such activities are needed for effective recovery, they should take priority over other species management and park operations. Significant modification of habitat and landform is discouraged unless necessary to prevent extirpation or extinction of the species. Manipulative activities may properly displace portions of other native and/or non-native populations.

Where it has been determined by the FWS and the NPS that species restoration or population augmentation programs are desirable, the individuals selected should, to the greatest extent possible, be genetically and ecologically representative of park populations. If a species is totally extirpated from a park or region and restoration is determined to be appropriate, restoration may utilize closely related subspecies or varieties.

Any manipulation of the endangered and threatened individuals themselves could constitute a "take" (see Definitions), and may therefore only be done through a FWS permit or, for a marine mammal, a National Marine Fisheries Service permit. Such permits may be issued by either agency for scientific purposes or for enhancement of propagation or survival. Proposed permits are required to be published in the Federal Register and reviewed for 30 days; therefore, applications must be made well in advance of proposed actions. An NPS employee may aid a sick, injured, or orphaned specimen of endangered wildlife or care for a damaged or diseased plant for a limited time in an emergency situation without a permit. In such a situation, the FWS or NMFS should be contacted as soon as possible.

Collection of individuals for captive propagation programs is appropriate, consistent with the ESA and approved recovery plans, if such collections will not unduly retard recovery efforts within the park. Such collections may be made only with the appropriate permits. Use of tagging, banding, or other identification methods should be coordinated with cooperating agencies to ensure consistency with other programs. These actions also require a FWS or NMFS permit.

C. Problem or Dangerous Individuals

Management of problem or dangerous individuals should be addressed specifically in resource management plans. Provisions for dealing with these individuals should be coordinated with the FWS/NMFS and appropriate state agencies. If collection or removal of individuals is anticipated, parks and/or regions should develop or encourage the development of interagency protocols for handling such individuals.

Although federal regulations allow any person to "take" endangered wildlife in defense of human life, park RMPs should contain management strategies which prevent this situation from occurring. Regulations allow relocation of endangered wildlife which are a demonstrable but nonimmediate threat to human safety, provided that it is done in a humane manner; killing or injuring is allowed only if the individual cannot be captured and released unharmed in a remote area or presents an immediate threat to human life.

D. Salvage of Dead Specimens

Regions or parks should also obtain permits to authorize NPS employees to dispose of or salvage dead specimens useful for scientific study. Dead or collected specimens should be disposed of in accordance with 36 CFR 2.5 and other appropriate regulations.

E. Monitoring

Inventories and periodic monitoring should be done to provide data to direct and evaluate the success of recovery actions.

III. Management of Candidate Species and State Endangered and Threatened Species

Management of these species should, to the greatest extent possible, parallel the management of federally listed species. In the absence of approved recovery plans, subject matter experts from federal, state, or private entities (e.g., The Nature Conservancy's Natural Heritage Program) should be consulted to assist in establishing priorities for management actions.

These species should be listed within a project statement of the resource management plan, and a scheduled periodic monitoring effort should be identified. Monitoring reports should be prepared and information should be provided to the NPS regional and Washington Office T/E coordinators and to the appropriate Office of Endangered Species, FWS.

IV. Management of Rare and/or Sensitive Species

Such species may be identified by a variety of groups (e.g., The Nature Conservancy). Management of these species should be determined at the park level in consultation with concerned and knowledgeable parties. Although specific recovery actions may not be indicated, their identification as rare or sensitive species should warrant heightened management concern.

V. Research

Research on endangered and threatened species is encouraged, particularly when such research is identified in approved recovery plans and in accordance with recovery priorities. As much as possible, this research should be coordinated with other agencies or conducted cooperatively to ensure its effective contribution to the recovery program. Any research which constitutes a "taking" requires a FWS or NMFS permit. (See discussion under Manipulative Activities, above.) When similar populations occur outside parks and are available for research use, the benefits of using park populations for research must be weighed against potential impacts of that research on park populations. For research projects conducted through research contracts, instruction should be provided that sensitive location information should not be included in reports prepared for general circulation.

VI. Coordination with Other Federal and State Agencies

A. Recovery

Management of candidate, threatened, and endangered species recovery efforts should be coordinated and integrated with other federal and state agencies to ensure that recovery efforts achieve maximum effectiveness and efficiency. The NPS should participate on recovery teams for those species that occur in units of the National Park System. Development of or participation in cooperative agreements, interagency agreements, memoranda of understanding, and coordination meetings is encouraged if such development or participation contributes toward meeting recovery objectives. Involvement of nongovernmental entities may be appropriate for many recovery efforts.

NPS recovery efforts must be conducted in accordance with all appropriate permits from other government agencies if such permits are required to implement recovery activities. Recovery activities conducted within parks by individuals or other agencies should be managed under the guidance contained in NPS-53 and NPS-20 when issuing collecting permits or special use permits.

B. Consultation under Section 7 of the Endangered Species Act

Park management must consult with the FWS pursuant to Section 7 of the ESA on any existing or proposed park activities or programs which "may affect" endangered species or result in the adverse modification of critical habitat. These consultations begin on an informal basis, which allows more flexibility in deadlines. If the situation requires extensive investigation, or the project

is a major or significant action requiring an EIS, or is controversial, the process moves to the **formal** consultation stage. (The process is called a "conference" if it deals with proposed species and a "consultation" when addressing already designated species.) Formal and informal contacts should also be maintained with endangered species coordinators from other federal and state agencies. (A Section 7 procedural flow chart is presented in Exhibit 1.)

To begin the **informal** consultation process, the FWS should be asked in writing to review the existing list or to produce a list of any candidate or listed species occurring in or near the project area. The FWS will respond within 30 days. If there are no threatened or endangered species, this information is documented, and the project proceeds. If it is determined that, based on the best scientific data available, such species may be present, then the NPS must determine if the proposed action "may affect" that species. This determination must be documented in the compliance process and will require data collection and continuing informal consultation with the FWS. It is also possible to begin a formal consultation at this step.

At this point, informal discussions with the FWS may result in suggested modifications to the proposed action that will ensure that it will not affect the listed species. If during this informal consultation the NPS determines that the proposed action will have "no affect" on the listed species or critical habitat, then the informal consultation process ends. Written documentation of this decision should be provided to the FWS.

The **formal** process begins when it is determined that the proposed action "is likely to adversely affect" an endangered or threatened species. In this situation, (or if the project requires an EIS, as in the case of major construction activities) a Biological Assessment is to be prepared by NPS to send to the FWS for the purposes of identifying any endangered species or threatened species which are likely to be affected and to assess the potential impact. The NPS has 180 days to complete a Biological Assessment once the process is initiated. Although the content of the assessment is at the discretion of the NPS, suggestions by the FWS are found in 50 CFR 402.12.

The FWS renders a biological opinion within 90 days detailing whether the proposed action is likely to jeopardize the species or its critical habitat. If the decision is that there is "no jeopardy," then the project may go forward. If the biological opinion is that the action is likely to jeopardize the species (i.e., a "jeopardy opinion"), then the biological opinion must also suggest those "reasonable and prudent alternatives" which, when implemented, will avoid jeopardizing the continued existence of any endangered or threatened species or adversely modifying the critical habitat of such species. This information should be included in the documentation prepared in compliance with Section 102 of the National Environmental Policy Act. If a jeopardy opinion is anticipated or issued, the park superintendent should notify the regional endangered species coordinator, who will contact the Associate Director, Natural Resources.

The FWS also issues a statement of anticipated "incidental take," if any is expected, along with the biological opinion, specifying nondiscretionary measures that must be taken to minimize the "take"

of members of the affected species. The FWS may also provide to NPS advisory recommendations on conservation of the species during the action.

For more information concerning Section 7 procedures, contact a FWS field office or the Washington Office threatened and endangered species coordinator.

VII. Information and Education

On-site and off-site interpretive programs should deal with all federal, state, and locally listed threatened, endangered, rare, declining, sensitive, or candidate species which are native to and present within the park boundaries. When and where visitor use will not adversely impact those species, interpretive programs which provide for viewing these species and their habitat are encouraged. Care should be taken to withhold disclosure of sensitive information that may result in disturbance or other adverse impacts.

ROLES AND RESPONSIBILITIES

I. Park

The **superintendent** ensures that park operations do not adversely affect listed, candidate, rare, and sensitive species, their habitats, or recovery efforts within the park. He/she also ensures consideration of these species in all other park plans and NEPA documents and integrates park management actions with those of other federal and state agencies. The superintendent assures proper consultation with FWS\NMFS, although this consultation is actually initiated by the Regional Director, unless delegated.

The **resource manager** coordinates or directs recovery activities in the park and is responsible for monitoring the species' status on park lands. The resource manager may participate on recovery teams. In addition, he/she incorporates endangered species concerns in resource management plans and NEPA documents; maintains appropriate scientific and management contacts with other federal, state, and private agencies and organizations; reviews other agency/organization plans and environmental documents to assess potential impacts on endangered species; and thoroughly documents, through the preparation of an annual report, all recovery actions and considerations.

II. Region

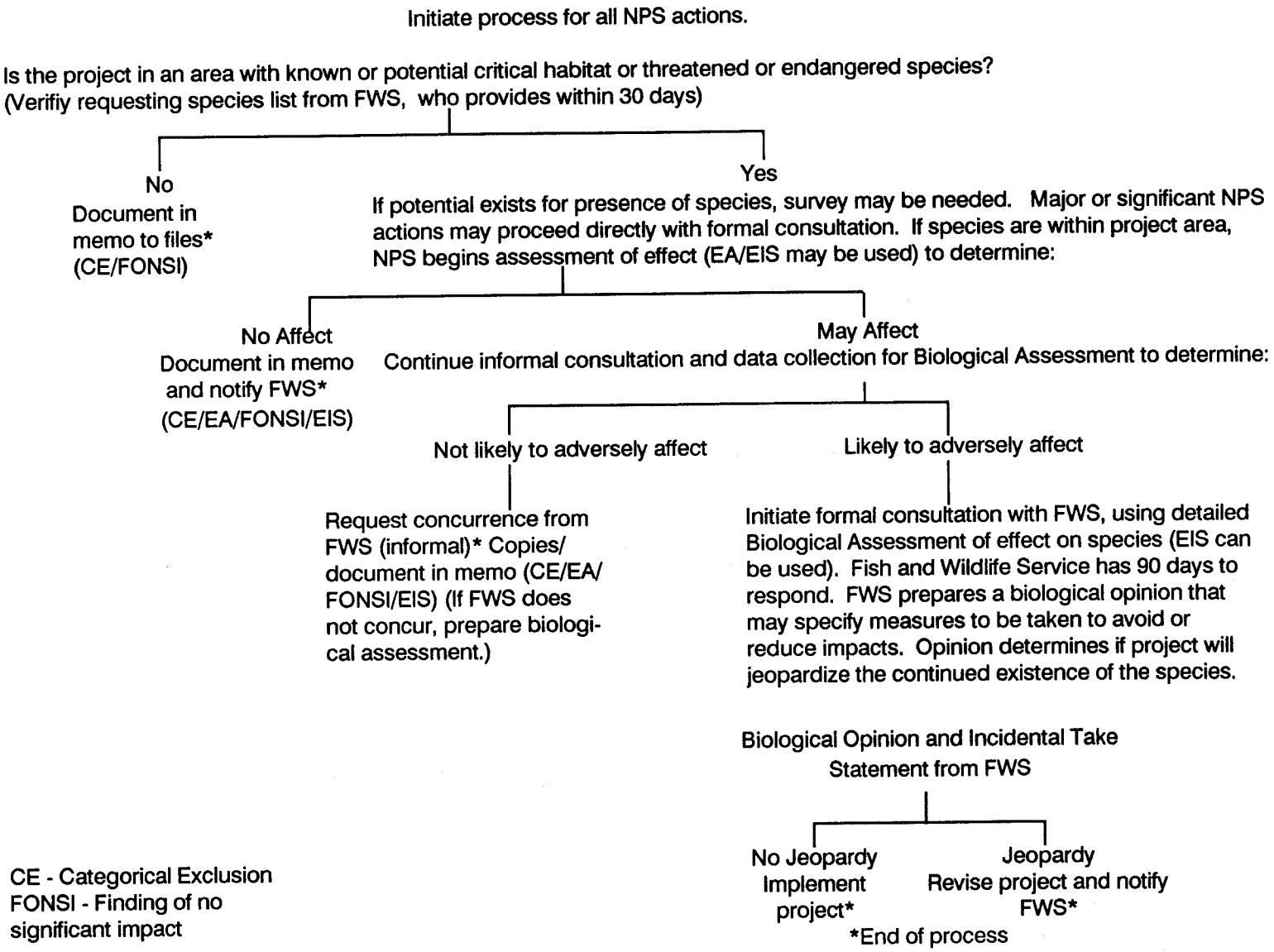
The **Regional Director** ensures appropriate consideration of federally and state listed species as well as all other special status species in all NPS plans and NEPA documents. The Regional Director ensures consideration of listed, candidate, rare, and sensitive species in review of other agency/organization plans and NEPA documents and supports participation of NPS personnel on recovery teams. The regional office **T/E coordinator** coordinates multi-park, and, in some cases, individual park research and monitoring activities and is responsible for the preparation of an annual report on T/E activities including inventory and monitoring efforts, research, population

status reports, threat identification, and funds expended. While the park superintendent is responsible for assuring that all necessary consultation is completed prior to implementing a project, formal consultation actions are initiated by the Regional Director unless specifically delegated.

III. Washington Office

The Washington Office provides direction, interpretation, and advice on new or amended legislation and Departmental directives, and issues policy and guidelines. The NPS T/E coordinator also compiles an annual report on funds expended Servicewide on endangered species.

THREATENED AND ENDANGERED SPECIES CONSULTATION PROCESS



CE - Categorical Exclusion
FONSI - Finding of no significant impact

EXOTIC SPECIES MANAGEMENT
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EXOTIC SPECIES MANAGEMENT

Although many exotic species have minor (or unknown) impacts on native ecosystems, some are extremely disruptive. This section offers guidelines and recommendations about exotic species management. It is oriented toward terrestrial species and habitats; however, much of the information presented and principles discussed are equally applicable to aquatic species and habitats. See Chapter 2, Freshwater Resources Management and Marine Resources Management, and Chapter 3, Fishing, for additional information regarding the management of exotic species in aquatic environments.

DEFINITIONS

Exotic species A species occurring in a given place as a result of direct or indirect, deliberate, or accidental actions by humans.

Native species A species that occurs and evolves naturally without human intervention or manipulation. Species that move into an area without the direct or indirect aid of humans are considered native by NPS definition.

Those that invade with human intervention are considered to be exotic. A taxon of fish moving upstream following the removal of a natural dispersal barrier by humans is exotic. A plant species native to Europe which becomes established near a park because of human activities (e.g., transported on board a ship) and expands its range into the park, even with the help of native species such as birds, is exotic.

Exotic, non-native, introduced, and alien are synonymous terms. The term exotic is used here because it is used in the professional literature and in NPS Management Policies. However, "alien," "non-native," or "introduced species" might be better terms to use with public/nonprofessional audiences, as "exotic" has a different connotation for most such people.

Three special categories of exotic species are important in the management of cultural landscapes:

Historic cultivars Varieties of domestic, ornamental, or crop plants which may be genetically or morphologically distinct from the common contemporary varieties, were present in historic districts during periods of significance, and have been used historically.

Minor breeds Rare genetic variants of common domestic animal species or domestic species of very limited population size or range. Included are some feral animal populations that, because of extended residence in the same site, have adapted to local conditions and become genetically distinct from parent populations.

Introductions by indigenous peoples Plant or animal species introduced or cultivated by indigenous peoples prior to the time of European settlement. These species occur because of human intervention, but have long histories on site. This category of species is probably less relevant in continental North America than on remote islands, where species introduced by indigenous peoples are usually distinguishable from native and exotic species. Many preserve managers define exotic species in the United States as those introduced by Europeans. This definition differs from the NPS definition in that it includes as native the few species introduced by indigenous peoples, e.g., the introduction of coconut palms into Hawaii by Polynesians.

POLICY AND PROGRAM OBJECTIVES

NPS Management Policies addresses exotic species management mainly in the section on Exotic Plants and Animals (4:11-12). It is also discussed in Population Management (of animals) (4:6), Fisheries Management (4:7), Landscapes and Plants (4:8), and Pests (4:13).

In general, the NPS strives to protect and preserve all species of native flora and fauna within all management areas. Regarding exotic species, Management Policies states that:

> Nonnative [exotic] plants and animals will not be introduced into natural zones except in rare cases where they are the nearest living relatives of extirpated native species, where they are improved varieties of native species that cannot survive current environmental conditions, where they may be used to control established exotic species, or when directed by law or expressed legislative intent.
>
> In cultural zones, [exotic] plant and animal species may be introduced in rare cases as described for natural zones. In addition, nonnative species that are a desirable part of the historic scene being represented in a cultural zone may be introduced, but only if they are controlled by such means as cultivating for plants or tethering, herding, or pasturing for animals. In such cases the exotics used must be those which are known either to have existed in the park during its period of historical significance or to have been commonly used in the local area at that time.
>
> In park development and special use zones (particularly landscape subzones), exotic species of plants and animals may be introduced to carry out NPS programs consistent with park objectives only when all the following conditions exist:
>
> > Available native species will not meet the needs of the management program.
> >
> > Based on scientific advice from appropriate federal, state, local, and nongovernmental sources, the exotic species will not become a pest.
> >
> > Such introductions will not spread and disrupt desirable adjacent natural plant and animal communities and associations, particularly those of natural zones.

> Management of populations of exotic plant and animal species, up to and including eradication, will be undertaken wherever such species threaten park resources or public health....High priority will be given to the management of exotic species that have a substantial impact on park resources and that can reasonably be expected to be successfully controlled. (4:12)

NPS Management Policies does not specifically address special categories of exotics such as taxa introduced by indigenous peoples, minor breeds, and historic cultivars. Guidelines in keeping with the spirit of NPS management policy are offered for their management.

Management of exotic biota should be carried out under integrated pest management (IPM) procedures. The biology of the invading species should be understood, the disruptive potential of the exotic species determined, acceptable levels of damage established, and the proper combination of control methods which cause the least hazard to people, property, and the environment used.

RELATIONSHIP TO OTHER GUIDANCE

In this Guideline, exotic species management is also addressed in Chapter 2, Native Animal Management, Vegetation Management, Marine Resources Management, Freshwater Resources Management, and Integrated Pest Management, which replaces the Guide for Pesticide Use in the National Park System. See also Chapter 3, Fishing, for guidelines specific to the management of exotic fish species.

PROGRAM GUIDANCE

Each target exotic species requires an individualized management and monitoring program tailored to the park setting. Control strategies often vary among ecosystems and target organisms, and differ between cultural and natural management zones.

I. Prevention of Exotic Species Invasions

The first line of defense against exotic species is prevention of their arrival and establishment. However, parks cannot be effectively quarantined from all accidental introductions by humans. Park managers themselves have been responsible in the past for some exotic species invasions in parks through deliberate or accidental introductions. NPS Management Policies (Introduction of New Exotic Species) (4:11) now prohibits essentially all deliberate exotic species introductions.

The following measures will help prevent or mitigate accidental introductions:

1. Before disturbing any native ecosystems, either through construction or management activities such as prescribed burning, identify the exotic species likely to invade the

disturbed areas, take measures to prevent such invasion, and assess those measures through the environmental compliance process.

2. Fill used in construction projects, feed for pack stock, and other materials likely to transport exotics should be as free as possible of exotic plant propagules. Use in-park sources where appropriate and select carefully any outside sources used. Know your sources.

3. Cultivars and domestic species brought into historic or managed districts should be free of diseases and parasites likely to spread to native species. Species that carry diseases which can be spread easily to native species should be prevented from entering park areas where susceptible species are present. Superintendents should work with adjoining land owners to prevent spread of disease from domestic species to native species. Vaccination and application of medication to wild stock may be used as necessary to prevent encroachment of exotic disease organisms and parasites.

4. Superintendents should discourage state game or fishery agencies from introducing potentially invasive or disruptive exotics into areas near park boundaries.

5. Control exotic species established on neighboring lands before they become established in the park. This approach is feasible when the populations are localized and neighbors are cooperative.

II. Management of Established Exotic Species

The following sections apply to management of exotic species already established in a park.

A. Species Evaluation

The first step in evaluating the importance of exotic species to a park is to prepare and maintain a checklist of all introduced species in the park. This list should be appended by a list of species which are not yet found in the park but may become established. Lists of exotic vascular plants and vertebrates are more easily prepared than those of invertebrates, fungi, etc., which usually require the assistance of a number of systematists specializing in different taxa. However, serious defoliations, reproduction problems, or diebacks may be clues that problem exotic invertebrates or pathogens are present.

The second step in evaluating the importance of exotic species is to conduct extensive surveys to locate and map all populations and estimate their numbers. The third step is to categorize them according to the potential for harming park resources. A minimum of two categories of exotic species --innocuous species and disruptive species-- helps to determine action priorities.

1. Innocuous species

These exotic species do not significantly harm park resources and do not require management. Some innocuous species have low populations within the park, or are restricted to areas subject to continuing human disturbance, such as lawns and roadsides. Most innocuous species do not invade native ecosystems without human-caused disturbance, and their populations generally do not expand within the park. Others may invade native ecosystems, but generally do not displace native species to a significant extent. Populations may be widely scattered in a park, but there is no evidence they are extinguishing native species populations, threatening human health, or damaging historic resources. Management efforts should not be squandered on innocuous species. However, bear in mind that disruptive and widespread species might have been perceived as innocuous when first invading because of their limited distribution.

2. Disruptive species

These exotic species have species, community-level, or ecosystem-level effects, significantly altering natural processes such as: fire regimes, nutrient cycling, hydrology or successional patterns; or altering species composition and reducing populations of native species; or through hybridization with native species. Some species are disruptive if they affect localized resources such as archeological features or scenic qualities on a broad scale. Some disruptive species, such as annual grasses in California, were established many years ago and may have done all the damage they will do. These ecosystem impacts are probably irreversible. Others, such as paperbark in the Everglades, are now expanding rapidly, and their effects may still be reversible.

B. Developing an Information Base

Resource managers should develop a comprehensive information base about each invasive or disruptive species. The most productive sources of information are the literature, other resource managers, and specialists. This information base may indicate potential impacts, important biological factors leading to control programs, and effective control techniques. Baseline data on the host species, such as a range map, density of the population, and ecological role, is also needed as early as possible as a basis for any restoration undertaken.

C. Monitoring

Monitoring is essential for classification of exotic species as innocuous or disruptive and for implementation of an IPM approach to exotic species management. Exotic species suspected of being disruptive should be monitored to determine population growth trends and possible range expansions. Monitoring should be repeatable and quantitative and go beyond basic survey, inventory, and mapping.

For example, monitoring of exotic plant populations should include transects or plots to evaluate cover, density, or population structure changes, as well as distribution maps. Rate-of-spread

monitoring can be established for localized populations of plants by detailed mapping or transects. Exotic ungulates can be monitored by indirect disturbance/activity indexes along transects (e.g., frequency of pig rooting or other pig sign along transects) or by direct indexes of populations (e.g., aerial surveys of goats or burros). Disruptive exotic invertebrates or pathogens can be monitored by mapping impacts and rating their severity.

Park employees oriented to natural history are often the first to become aware of new exotic establishments and population changes. Park employees should be informed about exotic species being managed or monitored. Observations of target species made while conducting other park duties can help managers develop distribution maps. Such input also involves other park employees in resource management.

Although monitoring is a critical element of exotic species management, it should not supersede control when required, particularly in limiting new establishments and localized exotic species.

D. Initiation of Management Action

Control or eradication will be undertaken, where feasible, if exotic species threaten to alter natural ecosystems; seriously restrict, prey on, or compete with native populations; present a hazard to human health or safety; cause a major scenic or aesthetic intrusion; disrupt the integrity of an historic site; damage archeological resources; disturb or displace historic cultivars; extensively modify geophysical processes, such as sand deposition on beaches; or threaten resources or cause a health hazard outside the park.

Superintendents should document population size, extent, and effects on natural and cultural resources of disruptive exotic species prior to management (see Research and Monitoring, below). This usually requires literature and/or field research that documents displacement of native species or alteration of natural processes or cultural resources. However, with widespread exotics which have been extensively studied elsewhere it may only be necessary to document the effect of the exotic on individual park resources. Management plans for exotics will be developed at the park level in accordance with NPS resource management planning procedures, including provisions for public comment. The management of exotic species should be included in park resource management plans.

The amount of planning and provision for public comment required will, in part, be a function of the extent of the exotic species involvement in park ecosystems. For example, removal of a few isolated exotic plants infesting a few square feet will require significantly less planning than would a management program involving removal of thousands of plants infesting hundreds or thousands of acres.

E. Need for Long-term Commitment

Exotic species control programs require long-term commitments, and, with many exotic species, short-term lapses may negate years of expensive control efforts. The reproductive potentials of invasive species are generally high, and often there will be ingress from outside the park, or recruitment from persistent seed banks. The key elements of all successful control programs are a systematic approach and consistent follow-up. Initial control efforts may require a considerable investment, e.g., building fences, hunting, trapping, electroshocking, or species-specific toxicants (where feasible), but, typically, subsequent control efforts require reduced amounts of labor and materials. Some exotic species require an indefinite management commitment.

F. Management Strategies

1. General Guidance

An **ecosystem level approach** to exotic species control is probably the best long-term and cost-effective management strategy, particularly with widespread exotics. For example, alteration of disturbance regimes, such as fire and flooding, and removal of exotic ungulates, may restore native vegetation. Cultural techniques are sometimes useful in exotic species control. Working outside the park to prevent the insularization of habitats which may result in the encroachment of non-native species and loss of native populations, species, or genetic fitness is an ecosystem level strategy in exotic species management. However, species management is necessary to control many exotic species and is frequently the most cost-effective strategy with newly established, localized species.

Determining the feasibility of control is essential in developing a management strategy. Use of the following categories of exotic species can be helpful:

1. species present in localized populations;

2. species controllable only in selected areas or confinable to certain areas of the park;

3. species controllable parkwide, even though this may require removal from one area at a time;

4. species controllable parkwide, but this can only be accomplished by a coordinated, comprehensive effort involving neighboring land managers; and

5. uncontrollable species.

Localized exotics are the most amenable to control efforts. It may even be possible to eradicate these species if management is prompt, ingress from outside areas is not important, and, in plants, seed longevity is short. Regular surveys to determine establishment or ingress are critical to control

of localized exotics. It is impractical to systematically survey large parks; however, exotics often establish along predictable avenues of invasion such as roadsides, developed areas, or in suitable habitat. For example, the finite number of springs or streams in some desert parks are routinely checked for tamarisk establishment, and plants are removed before they set seed. Once plants become widespread, control programs may require great effort or may become unfeasible.

Widespread exotic species may not be controllable throughout an entire park. However, there are several successful methods that lessen the impact of these exotics. One method is to control these species in selected areas. For example, seven widespread exotic plant species in Hawaii Volcanoes are controlled in ten areas of the park called Special Ecological Areas (SEAs), but not in the rest of the park. These areas were selected mainly because of their manageability, high species diversity, and low numbers of exotic species. Feral pigs in rainforest are managed by the same approach. SEAs also serve as experimental management units for determining the most effective control methods for target species and the impacts of exotic species management on park ecosystems. A Special Ecological Area approach is particularly effective in environments with serious exotic species problems. It works only if reinvasion rates are manageable and there are human resources for permanent control programs in these areas.

Another approach is to confine widespread exotic species to certain portions of a park. For example, it may be possible to fence ungulates out of only parts of a park because of rugged terrain that precludes fence construction. Plant species that disperse over short distances are amenable to this approach. The active front of a plant invasion is on the periphery of an infestation, from dispersal of the outlying populations. If control efforts are not possible for the entire infestation of a plant species, then these outlying foci should be controlled first. Control efforts should then work toward the center. Surveys should be conducted beyond the controlled area to assure that long-distance establishment has not taken place. Through this approach a grass species in Hawaii Volcanoes has been confined to an infested area in the corner of the park.

An incremental approach is often productive with widespread exotic species. For example, desultory control efforts on feral goats in Hawaii were ineffective from 1916 to 1970. However, goats were readily controlled in the 1970s by subdividing the goat-infested area with fences and eliminating goats one section at a time. Special Ecological Areas also represent an incremental approach to widespread exotic species management. As control efforts succeed in SEAs, these areas can be expanded or new SEAs can be established. What is learned in managing one area can often be applied to another.

Other widespread species may be controllable throughout a park, using a regional approach to management. Regional approaches are best applied to exotic ungulate, widespread exotic plant, and biocontrol programs. This approach has been successful with burro problems in Death Valley, with adjacent military reservations removing burros on one side of the park and Bureau of Land Management (BLM) wranglers, under an agreement with the NPS, carrying out eradication efforts in Death Valley. Also, Everglades developed interagency agreements on paperbark control which

include publications and public information, model ordinances for exotic plant control, funding for some control efforts, and a cooperative biocontrol program.

Some widespread exotic species cannot be controlled or can be controlled only partially. In these cases, their impacts must be accepted, and management must attempt to mitigate them. For example, exotic grasses have altered the fire regime at Hawaii Volcanoes to the detriment of native species. However, an active program of fuel reduction and construction of fuel breaks has been undertaken to reduce the impacts of fire. At the minimum, the effects of uncontrollable exotics on park ecosystems and other resources will be documented. At Hawaii Volcanoes, fire effects studies are documenting the negative effects of exotic grasses in both burned areas and in adjacent unburned areas.

2. Guidance by Taxa

a. Exotic Ungulates

Control techniques vary greatly for exotic ungulates, depending on target species, vegetation, topography, nontarget wildlife, size of management area, degree of infestation, and political considerations. Specific prescriptions cannot be recommended. Herding and driving, trapping, systematic hunting, and snaring have been the primary methods used successfully in U.S. parks, and there is probably an optimal mix of these techniques in different areas to be determined by experience or research.

Drop nets operated from the ground or from helicopters have been used in live captures. Hawaii Volcanoes has successfully used a "Judas goat" technique to remove the remaining few goats in the park and to monitor for ingress into control units. In this procedure, goats are captured and equipped with radio collars. Since goats are gregarious, instrumented animals will seek out other goats. These small herds are tracked by telemetry, and noncollared goats are removed. A Judas goat technique may be useful in monitoring and controlling other gregarious ungulates. Sterilants have been considered for exotic ungulates but never successfully applied to large numbers of free-roaming ungulates. Toxicants are effectively used in New Zealand and Australia but have not been used in NPS areas. Toxicants present problems in specificity, nontarget and secondary hazards, and public relations. No toxicants are currently registered for use with feral ungulates in the United States.

Most exotic ungulates have relatively high reproductive potentials, and minor recruitment from outside areas can lead to rapid population increases. Since differences in the management objectives of adjacent areas may vary from sustained yield to eradication, fencing is required in many exotic ungulate control programs.

Fencing is a complex and technical subject, and fencing specifications vary with the target animal, terrain, vegetation, and other considerations. The experience of state and federal parks in California is that hunting and other control techniques for feral pigs are inadequate without

fencing. In burro control programs in the Southwest, fences have been needed only in certain areas and sometimes not at all. In some cases, the park may support a disjunct population of an exotic ungulate. Ingress may naturally be very low because of low population levels outside the park or natural barriers such as steep canyons or mountain ranges.

An incremental approach can be used, with construction of one fenced unit at a time, followed by control efforts in each unit. Fences for feral ungulates may interfere with movements of native wildlife, but changes in design can correct that problem.

There are some disadvantages to fencing for exotic ungulate control. Fences for feral ungulates can be very expensive. For example in remote rainforests in Haleakala, fences cost nearly $100,000 per mile. In addition, fences need to be replaced periodically and maintained at frequent intervals. Minor breeches in fences can result in significant ingress. And in Hawaii, electric fencing has been demonstrated to be ineffective in restricting feral goats, even though it is effective with domestic livestock in pasture settings. It may not be feasible to fence an entire park for political or economic reasons, and control of exotic ungulates may not be possible in large fenced units.

For optimal fence design and specifications, managers should consult parks with exotic ungulate control programs, BLM wildlife and grazing specialists, local ranches, and county and university extension rangeland advisors.

All animals captured and handled as part of an exotic control program should be treated as humanely as possible. Captured animals should be provided with food and water. Killing should be as quick and as painless as possible. Immobilizing compounds may be used for capturing and removing exotic or feral animals from parks. Use of chemical immobilizing agents must be in accordance with NPS policy and Food and Drug Administration regulations. All staff operating capture equipment, including traps or dart guns, must be trained in the operation of this equipment and in human and animal safety. Records will be kept on the number of animals handled or removed and the disposition of the animals. (See also Chapter 5, Certification.)

Parks may release feral or domestic animals to adoption programs or public sales sponsored by nonprofit organizations or federal or state agencies. However, the NPS should insure that their animals will not be released into areas where they are not native. Park sponsored adoption programs can be very expensive, and there is often a limit to the number and kinds of captured ungulates that the public will adopt. When animals are released, the receiving party must agree to transport and dispose of them in accordance with state and federal law, and to have the animals inspected by a veterinarian before transfer to another party. Flesh from animals taken in an exotic ungulate control or research program cannot be released for human consumption, even to charitable or public organizations such as schools and prisons, unless it meets all state and federal health standards.

Exotic ungulate control programs often invite closer public scrutiny than exotic plant control programs because of concerns about animal rights, humaneness, and the loss of game species for

local hunters. Public relations considerations may, in fact, be paramount in exotic animal control programs. NPS managers should convince the public of the need and humaneness of their programs prior to control work. They should establish the fact that protection and preservation of native ecosystems represents one of the primary legal mandates of the National Park System.

b. Small Mammal Control

Control of small introduced mammals such as exotic rats, feral cats and dogs, and exotic mongooses may be necessary. These species are usually problems on remote islands or where wildlife is vulnerable, e.g., breeding concentrations. Trapping may be effective in localized areas depending on ingress from surrounding areas. Drop bait toxicants can be used but this requires thorough research and probably special registration of pesticides. The potential for secondary toxicity is sometimes considerable, but can often be overcome through proper timing, bait placement, bait station design, and species-specific chemicals.

c. Exotic Plant Control

Exotic plant control programs can be quite complex because each target species will probably require a different monitoring and control strategy. Control programs in parks and preserves have been much more effective, to date, in controlling introduced ungulate species than exotic plants. Some exotic plant problems have proven to be relatively intractable, except for isolated examples of successful biological control, or control of localized populations and widespread species in selected areas. It may not be possible to control some widespread species, even with biological control or ecosystem-level approaches such as modifying disturbance regimes.

Long-term or even permanent management commitments and consistent follow-up are essential to successful exotic plant control programs. Persistent seed banks and long-lived seeds often require control efforts over many years to eradicate exotic plants in a park, even if the species are quite localized.

Systematic approaches are the key to effective field control efforts. One proven field technique spaces control workers along a line at distances that assure that they can see all target plants between them and communicate among themselves. Control workers then walk parallel transects on the same bearing to thoroughly survey an area. Initial control of exotic plants, particularly woody species, will accelerate recruitment from the seed bank. Missed treatment cycles can actually result in population levels greater than pre-control levels.

Herbicides are frequently needed in exotic plant programs because of the ineffectiveness or unavailability of biological control agents and the inapplicability of mechanical and cultural control methods in native systems. Biological control agents are available for only a few exotic plant species, and the research required to locate and test potential biological control agents is beyond the individual capabilities of parks (see Biological Control, below). Most woody exotic plant species

resprout from the cut stump, root crown, or roots when cut or disturbed without the application of herbicides.

Cultural techniques involve manipulating the habitat to present exotic plant invaders with effective native competitors. This approach is preferable to use of herbicides and is very effective in managed ecosystems, but has its limitations in natural ecosystems. Cultural techniques may require considerable habitat modification and raise questions about artificially changing native plant communities. Developing cultural control techniques requires substantial research. In addition, the use of native species may not be effective in suppressing exotic plant species. Exotic plants invasive enough to require control programs are usually very successful in competing against native species. However, cultural techniques may be a necessary component of a control program designed for densely distributed exotic plants. Native plants may need to be planted or encouraged in those areas from which exotic vegetation has been removed. Exotic plants, as natural weedy invaders, usually colonize sites from which dense stands of exotic plants have been removed.

Manipulation of natural disturbance regimes may be effective in controlling some exotic species. For example, preserve managers in the Midwest have been successful in reducing exotic shrub species to restore native tall grass prairie with prescribed fire, and park managers in the Everglades have successfully controlled Brazilian pepper (Schinus terebinthifolius) invasion in the pinelands with prescribed fire. However, fire may stimulate exotic species such as paperbark (Melaleuca quinquenervia), cheatgrass (Bromus tectorum), or bull thistle (Cirsium vulgare), which are better adapted to disturbance than native plants. Flooding exotics with salt water to duplicate major storms or tidal waves may be effective along coastal areas in Hawaii. Removal of disturbance sources such as fire or feral pigs may be necessary, and may even be the only management needed to prevent the establishment of exotic plants or to enhance the competitiveness of native species.

There are several common errors made in developing approaches to exotic plant control. One is the failure to prepare sufficiently detailed and accurate distribution maps prior to treatment. Without such maps, the scope of the project will not be accurately evaluated at the outset and populations will not be accurately treated. Another common failure is insufficient testing of treatment methods, particularly herbicides. Many woody plants are capable of resprouting as much as 12-18 months after treatment. Some plants can be very resilient and difficult to kill. A frequent error in cut-stump treatments is the failure to apply herbicide to stumps immediately after cutting. Plants vary greatly in their sensitivity to different herbicides, and a wide range of chemical controls may need to be tested to find an effective one. The label may be a partial guide to finding an effective herbicide. Only a few plant species are mentioned on labels. Plants which show sensitivity to an herbicide by the loss of leaves or the death of aerial portions may resprout. A common error is to increase the rate or concentration of herbicide. Often reduced rates of application or concentrations of these herbicides can be more effective because translocation is enhanced prior to the loss of physiological function. Higher rates may burn off leaves and reduce translocation. Poor timing of application can also reduce the effectiveness of herbicides and can increase the impact on nontarget plants.

Managers of exotic plants must often sell the value of control programs to other park managers. Removal of exotic plants precludes the deterioration of native ecosystems, but rapid and obvious recovery is not always apparent when exotic plants are removed. Because of this, exotic plant control does not arouse as much interest as ungulate control programs. Working with large animals appeals to most people, and it is usually possible to be successful and see ecosystem recovery in a short time frame. Exotic plant control usually involves long-term programs and subtle recovery.

d. Exotic Invertebrates

Exotic invertebrates pose special problems in that invertebrate irruptions can occur rapidly and involve extensive areas. Relatively well-developed integrated pest management strategies exist for some exotic insects, especially pests of forest trees. Consulting specialists and the literature about standard methods used in forest, agricultural, or urban environments can be a starting point for developing control programs in park settings. The Forest Pest Management Office of the U.S. Forest Service is a particularly good source of advice on both exotic invertebrates and exotic pathogens. However, it may not be possible to apply all commonly used techniques in natural ecosystems. For example, broad spectrum pesticides may kill important native insects as well as exotic species.

e. Exotic Pathogens

Pathogens are not as well known as higher groups of organisms, especially those of noncommercial, native species; this complicates developing control programs for pathogens of native species. Established integrated pest management strategies have been developed for some introduced pathogens, especially those of commercial forest species. However, commonly recommended strategies may be applicable only to a limited number of host individuals or small areas in parks. Long-term strategies such as removing all infected individuals or replacing native varieties of host species with resistant varieties may not be feasible in parks.

f. Exotic Fish

Exotic fish pose a particular problem because their effects and their spread cannot be readily observed. Exotic fish may deplete or extirpate native invertebrates or fish by competition or predation and can affect the genetic integrity of native fish through interbreeding (See Chapter 3, Fishing). The introduction of fish to fish-free waters can be devastating to natural aquatic ecosystems. Originally fish-free aquatic ecosystems can be so altered by fish introductions that they cannot recover once fish are removed. Complete and permanent removal of all fish in a water body is very difficult except in closed systems such as small lakes where toxins may be used, repeatedly if necessary to kill the last survivors.

A technique that has been used with a fair measure of success in small stream situations in Great Smoky Mountains National Park to largely eradicate or control exotic fish species involves the incremental electroshocking and removal of exotic fish in affected stream sections coupled with the

use of natural stream barriers preventing reinvasion of the exotic species. However, electroshocking may not stun the last pair of potentially breeding exotic fish, or a few fish may be missed in the removal process. Similarly, few streams have natural barriers or offer the ideal physical configuration to easily create a semi-artificial barrier that would prevent reinvasion of exotic species. Rotenone and other general pesticides can also offer a potential control measure, under certain circumstances, if native fish species can be easily re-established after use of the pesticide. Large watersheds combining large streams and connected lake systems present particularly difficult and usually unsurmountable problems in the eradication of exotic fish species, given present available technology and few species-specific piscicides.

III. Management of Special Categories of Exotics in Cultural Landscapes

In cultural landscapes, exotic species should also be evaluated according to their cultural and/or historic significance and ethnographic value. Both cultivated and noncultivated species may be historically appropriate or important ethnographic resources. Native plants and animals, in fact, may require management if they are detrimental to the management of cultural landscapes.

A. Species Introduced by Indigenous Peoples

Plant or animal species introduced by indigenous peoples may be preserved and protected where they were introduced to the site prior to European settlement, and were culturally significant, and where their presence does not have any demonstrated impact on native species.

B. Minor Breeds

In some cases a park may support an exotic species that is also considered a minor breed or genetically distinct or of historic importance to the site. If the species is within an historic district, and it is not disruptive to other elements in the historic landscape, the species may be managed as necessary to maintain its population. If the species is disruptive, its population should be reduced to a low level, or, if it cannot be effectively managed on site, it should be removed. Under most circumstances, domestic animals should be kept in fenced enclosures.

If a minor breed is disruptive to native ecosystems outside cultural landscapes, it should be removed from the park. If the breed is of interest for genetic or agricultural research, the park may make arrangements to donate animals to universities, zoos, educational institutions, research stations, historic farmsteads or districts, or other public or nonprofit organizations or facilities interested in the preservation of minor breeds.

C. Historic Cultivars

If historic cultivars occur in a natural area, and they are not invasive, they may be left in place. If removal is chosen, parks will make arrangements to provide clippings, seeds, or other propagation materials from historic cultivars to botanical gardens, horticultural societies, historic districts

or parks, and other interested public or nonprofit organizations. Such donations should be documented so the plant material can be located if necessary. In historic districts, disruptive exotics may be replaced by cultivars, grass sward, crop land, or pasture, as well as by native plant communities which are historically appropriate, in conformance with an historic landscape management plan.

IV. Research and Monitoring

Research and monitoring are essential components of exotic species management. Monitoring to detect the establishment of new introductions and to evaluate the need for control efforts has been discussed. Monitoring is also necessary to assess the effectiveness of control programs and the influence of control activities upon both target species and nontarget species. For example, monitoring plots can be established around exotic plants treated with an herbicide. The cover and/or density of all plant species can be recorded before and after treatment.

Research is essential to determine the influences of exotic species on native ecosystems. Research is needed to determine if native plant and animal diversity and/or population distribution or density are being affected by exotic species. Research provides information to determine acceptable levels of ecological change by defining baseline conditions, ecological variability, and system mechanisms. Finally, long-term research and monitoring are essential in evaluating impacts which are subtle but important or that do not manifest themselves in the short-term; e.g., effects of pig rooting on forest succession or of Argentine ants on native arthropods and pollination. Documenting the effects of exotic species provides essential information for decision-makers, potential litigation, and the general public in controversial animal control programs; e.g., burros in the Grand Canyon and mountain goats in Olympic. Findings about impacts of exotics are necessary in evaluating the need for control programs or to document declines in ecosystems when exotic species are not controllable.

Research is invaluable in developing control methods and strategies. For plants, research can determine dispersal characteristics, seed viability in the soil, and establishment requirements. These characteristics may lead to an awareness of stages in the life cycle in which the exotic plant is vulnerable to control. Such studies have been conducted on Brazilian pepper in the Everglades and fire tree in Hawaii. Major studies may not be necessary where limited information is needed. Data on growth rates to determine treatment intervals and seed biology can be collected in a straightforward manner and provide valuable information for control programs. However, replicated, statistically sufficient research on cultural, mechanical, biological, and pesticide control methods is needed for widespread exotics.

For many terrestrial and aquatic animals, research can determine movement and social patterns, animal densities, food and shelter preferences, foraging strategies, reproductive potential, population structure, and limiting factors. Researchers can develop models and predict necessary removal rates for effective control. Research on specific control methods for ungulates and other animal species may be necessary. However, the opportunities for replicated research on small research

budgets may be more limiting with ungulates and other animal species than with plants. Carefully designed and monitored experimental management also leads to effective control methods. Managers and researchers can work together in this regard.

V. Biological Control

Biological control (biocontrol) may be a long-term solution to controlling some exotic species that are too widespread for control by conventional means and that readily reinvade the park. Biocontrol is the use of species-specific control agents, typically pathogens or arthropods from the host's range, to provide effective control of a target pest.

Park managers can either introduce established biological control agents to their parks or help develop biological control research programs for their target pests. It may be possible to introduce known biocontrol agents into a park to effect control if they are not already present, or to translocate biocontrol agents with low mobility from one part of the park to another. Permits from the state and federal agriculture agencies will probably be necessary, and the Washington Office IPM Coordinator must be consulted when considering the introduction of a biological control agent.

If biological control agents are not available, individual parks can support biological control research programs. Park managers should be aware that biological control research is an expensive and lengthy process; must be conducted in one of the few specialized quarantine research facilities in the nation; and involves foreign exploration in the natural range of the target species. Individual parks are not capable of supporting such research, and NPS does not have a Servicewide program. Biological control research has been initiated through cooperative agreements with other agencies, universities, and agricultural interests. This has been the approach in Florida with major weeds and in Hawaii. Hawaiian parks have heavily supported biological control research through construction and maintenance of a quarantine research facility and occasional support of foreign exploration or staffing costs.

Biocontrol should not be viewed as a panacea to widespread pest problems. Biocontrol agents may not be located or even exist, and, in fact, many biological control programs are not successful. It usually takes several years for researchers to find effective agents and for population levels of biocontrol agents to build up. Parks may not find the necessary support from other cooperators. Biocontrol agents may adversely affect native ecosystems by affecting nontarget species. Even specific biocontrol agents may switch hosts, for example, from one congener to another. Furthermore, biocontrol agents developed for use in agricultural settings or during the early history of biological control may affect many host plants, and specific agents are required in exotic species control in native ecosystems.

The use of biocontrol does not preclude use of cultural, mechanical, or chemical control methods. Conventional control methods may be used while biocontrol solutions are being developed. They may also supplement biocontrol when it is only partly effective.

VI. Integrated Pest Management and Pesticide Use

This is discussed in Chapter 2, Integrated Pest Management.

VII. Environmental Compliance and Planning Documents

Control methods may have adverse effects on nontarget native species or on park ecosystems. Also, they may disrupt visitor use or appreciation of park areas. To evaluate these problems prior to control actions, exotic species projects must be specified in approved resource management plans; Environmental Assessments or Environmental Impact Statements must be prepared for major projects; and, when feasible, a cost and impact comparison will be made among available techniques or strategies. It is prudent to prepare separate environmental compliance documents if the control program is controversial. The planning of complex programs is enhanced by the preparation of action plans. Significant program results should be communicated in NPS publications and in scientific and conservation management journals. Exotic species management is a growing field and the success of park managers with diverse exotic species management problems is enhanced by the spread of information.

Prior to utilizing any control procedure which causes clearing of vegetation, disruption of plant or animal community structure, or soil disturbance, park managers should prepare a plan for site recovery. Reestablishment of native species may be employed or managers may depend on natural successional processes. In extreme situations, scarification, burning, selective poisoning, or other site preparation methods may be used prior to reestablishment of native species.

In the case of large-scale programs, a plan should be made to provide information to park staff, residents of the surrounding areas, and park visitors. In the case of highly visible projects, formal interpretive programs or materials should be developed and press releases or briefings prepared. Local residents may be unsympathetic to the park manager's goals if the exotic species to be controlled is used locally or if pesticides are to be employed. Agency candor and integrity must be paramount in dealing with special interests.

ROLES AND RESPONSIBILITIES

Exotic species are managed at the park level, with the **superintendent**, as advised by the **park resource manager**, ultimately responsible for the programs. Scientists gather information necessary to support informed management, and they assist and advise resource managers with monitoring of resources. **Regional** and **Washington Office integrated pest management coordinators** advise on alternative nonpesticide control strategies and must approve pesticide use requests. The Washington Office **Wildlife and Vegetation Division** is responsible for the planning, coordination, policy formulation, and implementation of exotic species management programs at the Servicewide level. This includes planning, funding, and coordinating research studies on issues of Servicewide applicability and providing technical, scientific, planning, or implementation assistance to regions

and/or parks on exotic species management issues or projects. **Cultural Resources offices** can assist with the identification, evaluation, and conservation of historically appropriate exotics.

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HAZARDOUS WASTE MANAGEMENT

Proper management and disposal of hazardous materials is essential to protect valuable natural park resources. Every park that uses solvents, paints, degreasers, pesticides or other chemicals, or has underground storage tanks, covered or exposed on-site waste dumps, hazardous material storage areas, mine waste and tailings sites, or agriculturally worked lands is affected by hazardous waste regulations. This section discusses hazardous waste management requirements under specific laws and outlines the principal elements of a park waste management program.

DEFINITIONS

Hazardous waste As defined in the Resource Conservation and Recovery Act, a **characteristic** hazardous waste is waste that is corrosive, reactive, ignitable, or exhibits leachable properties under the EPA toxicity test, or is **listed** as a hazardous waste in 40 CFR 261.30-33. **Hazardous substances** are defined and listed in 40 CFR 302. The superintendent should recognize that there are hazardous materials that contain hazardous substances but that are not necessarily hazardous wastes.

POLICY AND PROGRAM OBJECTIVES

The NPS Management Policies requires park managers to:

> make efforts to avoid hazardous material incidents and to control or minimize them should they occur....The National Park Service will identify and take actions to address existing hazardous waste problems, buried toxic dumps and landfills, spills, and contamination of water, soil, and air. (9:6)

AUTHORITIES

In addition to the general authorities discussed in Chapter 1, authorities relating to hazardous waste management include: Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or Superfund); Federal Insecticide, Fungicide and Rodenticide Act (FIFRA); Clean Air Act; Clean Water Act; Occupational Safety and Health Act (OSHA); Resource Conservation and Recovery Act (RCRA); Natural Resource Damage Assessment Regulation; Defense Environmental Restoration Account (DERA); Office of Management and Budget Circular A-106; Safe Drinking Water Act; and Toxic Substances Control Act. Each of these authorities is discussed in more detail under Program Guidance, below.

RELATIONSHIP TO OTHER GUIDANCE

NPS-12, the Environmental Compliance guideline, provides overall guidance on park environmental compliance responsibilities. See also in this Guideline, Chapter 2, Air Resources Management, Freshwater Resources Management, and Marine Resources Management, and Chapter 4, Environmental Compliance and Emergency Management.

PROGRAM GUIDANCE

I. General

The NPS seeks to identify and remove hazardous waste from NPS areas. Identification can occur several ways. The most obvious way is through routine surveys by the NPS or regulatory agencies. Staff knowledge of present or previous activities--for example, concession activities--is an effective source of information. Recognition and reporting by staff or visitors is yet another valuable source. Removal involves a multi-staged regulated process which can include treatment, temporary storage, transportation, and final disposal.

Waste management potentially affects most, if not all, NPS program areas. The resource manager should therefore learn and understand existing waste management requirements, then share this knowledge with other program managers and the park superintendent. For example, the presence of hazardous wastes can affect land acquisition or risk employee and visitor health and safety. Maintenance, research, and concessioner activities can generate hazardous waste on park facilities or lands. Unexpected or unplanned release of wastes can result in damage to natural resources. Similarly, the resource manager can get valuable information from other program specialists. For example, the historian or archaeologist can often offer valuable expertise and insight to the resource manager regarding previous activities at a particular site.

II. Legal Requirements

Numerous environmental laws apply to hazardous waste issues. For many of these laws, authorization for responsibility has been delegated to the states, which may have equal or more stringent laws. Federal agencies, including the NPS, must generally comply with all provisions of federal environmental statutes and regulations including applicable state and local requirements. The following summary of these laws and some of their most important elements will enable the NPS resource manager to understand them and their effect on park natural resources.

A. Clean Air Act (CAA)

Federal facilities (including all NPS units and facilities) are subject to and must comply with all federal, state, interstate, and local requirements regarding air pollution prevention and mitigation.

The CAA regulates the emission of hazardous air pollutants. It established standards expressed as concentrations of designated hazardous pollutants called National Ambient Air Quality Standards (NAAQS). These standards are achieved through State Implementation Plans (SIP). There are also national air emission standards like New Source Performance Standards (NSPS), National Emissions Standards for Hazardous Air Pollutants (NESHAP), and standards governing mobile sources of air pollution including motor vehicle fuels. There are also special programs for the prevention of significant deterioration (PSD) in clean air areas and for stringent controls in nonattainment areas (NAA). (See Chapter 2, Air Resources Management for more detailed guidance on park requirements under the Clean Air Act.)

B. Clean Water Act (CWA)

The CWA, also known as the Federal Water Pollution Control Act Amendments, sets water quality standards and effluent limitations for stream water quality. Federal agencies are fully subject to this act both substantively and procedurally.

The CWA regulates sewage sludge, ocean dumping, and the filling of wetlands to prevent the discharge of hazardous pollutants into the nation's surface waters. Permits are required for all point sources from which pollutants are discharged to navigable waters. This permitting is done under the National Pollutant Discharge Elimination Program (NPDES). The CWA authorizes the National Contingency Plan (discussed under Emergency Response, below) for removal of oil and hazardous substances. (See further, Chapter 2, Freshwater Resources Management and Marine Resources Management.)

C. Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or Superfund)

CERCLA was enacted in 1980 to regulate the cleanup of hazardous or toxic contaminants at closed or abandoned sites. CERCLA also provides for the U.S. to respond to the release of any hazardous substance into the waters of the U.S. or if the release affects natural resources owned by the U.S.

A fund available to states was set up to address the cleanup of abandoned sites. Superfund monies come from taxes levied on designated chemical feedstocks. The government can recover cost of the cleanup and associated damages by suing the responsible parties.

Federal agencies cannot receive cleanup funding from the Superfund but rather must seek it through the budget process. However, if EPA determines that an emergency response action is warranted on a federal site, funding (up to $2 million) can be advanced to initiate the response. The money must be reimbursed to the fund.

CERCLA was reauthorized in 1986 under the Superfund Amendment Reauthorization Act (SARA). Section 120 of SARA specifies that CERCLA is applicable to federal facilities. SARA

establishes a tracking system for potential federal hazardous waste sites called the Federal Docket Site List. NPS sites are listed on the docket through the 3016 reporting procedure, a section of RCRA that requires a comprehensive inventory of all potentially hazardous sites located on federally owned or operated land. The 3016 report is discussed further under Program Management, below.

Title III of SARA also established the Emergency Planning and Community Right-to-Know Act (EPCRA). EPCRA is a separate law and is not part of CERCLA. EPCRA is discussed in more detail under Program Management, below.

The **Natural Resource Damage Assessment regulation (43 CFR 11)** establishes procedures that may be used in assessing natural resource damages for recovery by federal and state trustees under CERCLA and the Clean Water Act. The ruling provides mechanisms for government natural resource agencies to use in assessing monetary damages for natural resources injured or lost as a result of oil spills and hazardous releases.

A park has 3 years from the time of discovery to seek compensation for such natural resource damage. The law provides for the responsible party to pay for damages, restore the resource, and even replace the resource with another similar site. The law provides guidelines on the documentation for assessing natural resource damages.

The **Defense Environmental Restoration Account (DERA)** was set up to address the cleanup of Department of Defense (DOD) hazardous waste sites at existing and formerly owned DOD facilities. A fund (like the Superfund) is available for the cleanup actions. The program is managed by the U.S. Army Corps of Engineers.

If a park has a hazardous waste problem that was created by DOD, the site can be cleaned up through DERA. The four criteria for DERA eligibility are:

1. the site must have been directly transferred to NPS from DOD,

2. the hazardous waste program must have been created by DOD,

3. the hazardous waste problem must have been reported to DOD before or shortly after the time of realty transfer, and

4. NPS did not use the site/building for any purpose.

D. Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)

FIFRA is basically a registration law. All pesticides must be registered, and the pesticides must be used in accordance with the registration. The Act restricts the use of certain pesticides. Some

pesticides are regulated as toxic pollutants under the Clean Water Act and the Safe Drinking Water Act. (See further, Chapter 2, Integrated Pest Management.)

E. Occupational Safety and Health Act (OSHA)

There are several OSHA laws that affect hazardous waste issues. OSHA laws are primarily geared to the protection of employees against unsafe or unhealthy work environments.

Park employees, particularly those who work in the field, may discover a hazardous waste site in the course of carrying out their normal duties. If they are not informed and trained to deal with such events, exposures could result.

Under the OSHA regulations there are stringent requirements for a safety and health workplan and emergency response program, record-keeping, training, the use of personal protective equipment, and medical surveillance for employees working in or around a hazardous waste site or spill. Standards are set for maximum occupational exposure levels (29 CFR 1910.1000).

Under the Hazard Communication Ruling (29 CFR 1910.1200), the park must obtain the material safety data sheet (MSDS) from the manufacturer. The employees must be informed of the MSDS, have access to it, and receive training in working with the chemical-containing products.

OHSA also sets training requirements for employees that are associated with hazardous waste storage, treatment, disposal, and clean up actions. These training requirements are established in 29 CFR, 1910.120.

Consult with the regional or park safety officer if hazardous waste incidents occur.

F. Resource Conservation and Recovery Act (RCRA)

RCRA governs the generation, transportation, treatment, storage, and disposal (TSD) of current and future actively produced hazardous waste, solid waste, and underground storage tanks. Subtitle C of the statute authorizes a comprehensive program that regulates hazardous waste from generation to ultimate disposal (cradle to grave). Federal agencies are subject to federal, state, and local requirements.

Subtitle D of RCRA (Solid Waste) is regulated through state programs. Regulations for Hazardous Waste Management are in the Federal Register starting at 40 CFR 260. They are immediately preceded by certain solid waste regulations. The definitions of the four characteristic hazardous wastes are in the Federal Register at 40 CFR 261.20-24. **Listed** hazardous wastes can be found in the Federal Register at 40 CFR 261.30-33.

Some specific situations covered by the RCRA that park managers should be particularly aware of are described below.

1. Storage Site

If a park produces more than 1,000 kilograms (kg) (2,200 lbs.) of hazardous waste in any given month and stores it on site for longer than 90 days, there are stringent requirements involving constructing storage facilities, tracking of waste, and record keeping procedures. The hazardous waste must be disposed of in an approved treatment or disposal facility.

2. Small Quantity Generator (SQG) (40 CFR 262)

Small quantity generators are those parks that generate less than 1,000 kg per month of hazardous waste. There are two classes of SQG:

a. Generators of 100 to 1,000 kg (220 to 2,200 lbs.) per month. Parks in this category must obtain an identification number from EPA, can accumulate up to 6,000 kg of hazardous waste on site, and can store it up to 180 days. If the disposal facility is greater than 200 miles away, the storage time is extended to 270 days. For acutely toxic wastes, the regulated generated amount is 1 kg to 1,000 kg.

b. Generators of less than 100 kg per month. These parks are exempt from 40 CFR 262 as long as they do not accumulate amounts in excess of 1,000 kg. They must, however, identify their waste and comply with the less stringent storage and disposal requirements of 40 CFR 261.5.

Many parks will be small quantity generators, with wastes derived from vehicle maintenance, building construction and repair, and other similar activities.

3. Recycling

Some materials normally considered hazardous wastes may, in some circumstances, be recycled. The resource manager is cautioned to use discretion and be extremely familiar with the regulations for recycling found at 40 CFR 266. Some spent materials--for example, used motor oil that has been analyzed--may be recycled for energy recovery and therefore would not be considered a generated waste. Refer to the waste oil regulations at 40 CFR 266.40.

4. Underground Storage Tanks (UST)

EPA regulations for underground storage tanks (USTs) are applicable to many of the existing tank systems in the parks and to all new systems installed after December 21, 1988. There are legislative deadlines for tank/pipe systems and tank/pipe system replacement that must be implemented by 1999. Tanks must have leak detection, corrosion protection, and spill/overflow prevention features. The state regulatory authority must be notified whenever a UST is installed or permanently closed. Some USTs are exempt: those containing heating oil used on the premises where it is stored, for instance. Criteria for cleanup standards involving leaking underground tanks

use drinking water standards. More specific information regarding these regulations can be obtained from the regional hazardous waste coordinator.

G. Safe Drinking Water Act (SDWA) (1974)

SDWA was established to provide safe drinking water to the public. Standards are set for application to the water after treatment by the public drinking water system. The 1986 amendments require promulgation of primary drinking water regulations for 83 contaminants, regulate lead in public water systems, provide civil and criminal penalties for persons who tamper with public water systems, and require closer review of state programs.

H. Toxic Substances Control Act (TSCA)

TSCA regulates existing and new chemical substances and primarily applies to manufacturers, distributors, processors, and importers of chemicals. There are requirements for stock inventory, pre-manufacture notification, testing, reporting, and record keeping.

Polychlorinated biphenyls (PCBs) are regulated under this legislation.

PCBs are regulated when the concentration is greater than 50ppm. Equipment containing regulated PCBs must be properly labeled, inspected, and surveyed.

III. Emergency Response

The National Contingency Plan (NCP), authorized by Section 105 of CERCLA, requires the NPS to conduct hazardous substances emergency response planning. The NCP specifies a coordinated federal response capability at the scene of a potential or actual discharge of oil or release of a hazardous substance. This response activity is the responsibility of the National Response Team (NRT). The NRT is therefore responsible for developing the NCP and providing for its implementation and periodic update. This plan was completed on November 20, 1985. The NCP also required the development of Federal Regional Response Plans (RRPs). Similarly, Federal Regional Response Teams (RRTs) and Federal Response Centers are set up throughout the country. The NCP also requires that local planning be done. It is in the context of local planning that emergency response plans for NPS areas should be developed. The local park plan should be consistent with both the RRP and NCP. Planning is discussed in more detail under Program Management, below.

The Department of the Interior represents NPS on RRTs. Specifically, the representatives are regional environmental officers of the DOI Office of Environmental Affairs. DOI's regional environmental officers are a necessary link between NPS resource managers and the federal planning and response organization. The NPS resource manager should thus become familiar with the RRP for the federal region in which the park occurs.

Federal response is initiated by a report to the National Response Center. Federal law requires that a discharge or release of a "reportable quantity" be immediately reported. Reportable quantities are listed in the consolidated chemical list, which each regional hazardous waste coordinator has available. The National Response Center toll-free hotline number is 800-424-8802, or for the Washington, D.C., metropolitan area, (202) 426-2675. The National Office Response Center in turn notifies the Regional Response Center. Regional Response Centers are typically U.S. Coast Guard district offices or EPA regional offices. The U.S. Coast Guard and EPA are pre-designated by the NCP as Federal On Scene Coordinators (FOSC) during a federal spill response.

NPS resource managers should be prepared to provide specific resource information to the federal on scene coordinator. The on scene coordinator must make decisions based on the best available information. Resources for which the NPS has management responsibilities will therefore best be served if the resource manager can provide a completed and current park emergency response plan. If the resource manager cannot provide a park emergency response plan, the FOSC may have to make decisions that are not in the best interest of NPS resources.

"Cleanup" is a broad term meant to cover all response actions necessary to address a release, discharge, or spill of hazardous substances or oil. Response activities under Superfund are often referred to as cleanup. For example, the term cleanup may be used to refer to emergency response activities of the NRT or RRT. Likewise, cleanup may be a term which refers to a hazardous waste activity such as a remedial investigation/feasibility study prescribed by Superfund. The resource manager should be familiar with the broad usage of the term, and be aware that different laws may require different cleanup standards. The regional hazardous waste coordinator will be able to provide specific information on cleanup policy.

IV. Program Management

The waste management function encompasses many elements. In order to accomplish this function the resource manager needs to be knowledgeable about the aforementioned program goals, legislation, and specific responsibilities. Then, this knowledge needs to be applied to natural resource program management. Major program activities that the resource manager will encounter are briefly discussed. Exhibit 1 is an important list of Hotline telephone numbers that the resource manager can use to report incidents or obtain information.

A. Office of Management and Budget Circular A-106

Executive Order 12088 makes the heads of executive agencies responsible for seeing that their facilities, programs, and programs they fund meet environmental requirements. OMB Circular A-106 is the implementing document for agencies to use to identify, track, and report pollution abatement projects. The A-106 process ensures that environmental requirements are met and compliance problems corrected by identifying the funds needed for environmental purposes. It is a budget procedure and not a source of funding; however, it sets funding priorities to achieve environmental compliance.

B. Community Right to Know

The Emergency Planning and Community Right-to-Know Act (EPCRA) set up procedures for 1) emergency planning, 2) emergency notification, 3) community right-to-know reporting on chemicals, and 4) emissions inventory. All federal agencies, including the DOI/NPS, are exempt from most requirements of EPCRA. Nonetheless, DOI strongly encourages voluntary compliance with all portions of the law. EPCRA is designed to protect communities from hazardous chemicals by making sure that advance planning occurs for potential emergencies. Under emergency planning, states are required to establish a state commission and emergency planning districts. The resource manager should become familiar with this section of the law and know how the park fits into the overall state emergency planning scheme. The emergency notification section of EPCRA requires that the authorities be notified in the event of accidental releases or spills of chemicals on a CERCLA reportable quantities list and another EPA listing known as the Chemical Emergency Preparedness Interim Guidance or CEPP list. Communities have a legislated "right-to-know" when hazardous chemicals are being used nearby. Some requirements of EPCRA may therefore apply to the parks--for example, those with agricultural activities. Proper application of registered pesticides or fertilizers in accordance with their intended purpose is exempt from the law. Park planning documents should include emergency plans if justified by the quantity of chemicals kept on hand, and appropriate safety training should be provided.

C. Cost Recovery

Under CERCLA and SARA, cost recovery is a legal process that requires the responsible parties to reimburse the federal government for funds it spends on cleanup activities. The resource manager may be involved in investigating and documenting the effects of a spill or release on park natural resources, investigating potentially responsible parties, and participating in preparing and bringing legal action.

D. Planning, Response, Reporting, and Coordination

NPS has two major responsibilities regarding planning and response. One is to reduce the chance of a release or discharge from an NPS facility or vessel. The other is to develop the capability to respond promptly and adequately to a release or discharge from an NPS or other source. Yet another separate responsibility involves providing resources during federal cleanup operations on other than NPS lands.

There should be a regionwide approach to emergency response planning in NPS regions and respective parks. First, to provide consistency, an overall NPS regional plan should be developed. The NPS regional plan should serve as a guideline to individual park plan preparation by providing standard information common to all parks in the region. Each park plan should individually build on the regional plan. As individual park plans are developed and approved they should become part of the NPS regional plan. The NPS regional plan should similarly become part of the federal regional plan.

Exhibit 2 is a suggested outline for a typical park plan.

E. Process Protocols

Superfund requires certain steps and procedures to be followed when hazardous waste sites are addressed. The process of collecting and reviewing available information about a known or suspected hazardous waste site or release is called a preliminary assessment (PA). If further study is needed, a site inspection (SI) is undertaken and information is used to determine whether further action is indicated, based on the degree of hazard to human health and the environment. The PA and SI are submitted to EPA for potential inclusion on the national priorities list (NPL). An in-depth study to determine the nature and extent of contamination at a site is called a remedial investigation (RI). A feasibility study (FS) analyzes the practicability of cleanup alternatives, including such things as removal, containment, or treatment of the hazardous substances. Depending on the outcome of ranking on the NPL, a RI/FS may be required for highly contaminated sites. The actual implementation of the chosen alternative is called a remedial action. EPA provides specific guidance and protocols for addressing these steps. The resource manager should obtain technical advice and assistance from the regional hazardous waste coordinator prior to starting action on these steps.

F. Reporting Requirements: Section 3016

Under RCRA Section 3016, EPA must complete a comprehensive inventory of all potentially hazardous sites located on federally owned or operated land, such as NPS facilities and concession facilities. Information on the status of each site in the inventory is contained in a Federal Facilities Docket. If warranted, federal facilities will be included on the National Priorities List and mandatory requirements and timetables for corrective action will be established. In order to comply with Section 3016, all known or suspected sites must be reported and investigated. Normally EPA requires the 3016 inventory to be completed every 2 years.

G. Transportation, Treatment, Storage, and Disposal

RCRA addresses hazardous waste that is being generated every day. The regulations implementing RCRA ensure proper management of hazardous waste from the moment the waste is generated until its ultimate disposal. An identification and permitting system enables EPA and the states to assure safety and accountability in the transportation and treatment, storage, and disposal of hazardous waste. Generators of such waste must determine if their waste is legally hazardous and are responsible for its proper disposal. Regulations applicable to generators of hazardous waste are found in the Federal Register at 40 CFR 262.

As previously stated in Legal Requirements, above, those who produce between 220 and 2,200 pounds (or 100 to 1,000 kilograms) of hazardous waste in a calendar month are regulated by EPA as small quantity generators (SQGs). Whenever hazardous waste is disposed of it should only be

sent to authorized facilities by licensed transporters. The resource manager can obtain assistance in getting an identification number, a list of licensed transporters, or locations of approved disposal facilities from the regional hazardous waste coordinator.

RCRA hazardous waste regulations on transportation, treatment, storage, and disposal are found in the Federal Register at 40 CFR 263-265.

H. Waste Minimization

Parks are encouraged to practice waste minimization actions. Various approaches are used by industry to minimize the production of hazardous waste. Source separation keeps hazardous waste from contaminating nonhazardous waste. Recycling removes substances from the waste stream and returns them to productive use. Substitution replaces either raw materials or products with ones that generate little or no hazardous waste. An example would be the substitution of concrete posts for creosote-preserved wood posts, protecting ground water and soil quality. The natural resource manager needs to be aware of such opportunities to minimize hazardous waste problems in the park.

ROLES AND RESPONSIBILITIES

I. Park

The federal government used to be exempt from many reporting requirements and cleanup timetables imposed on industry, but this is no longer the case. The penalties for noncompliance can be both civil and criminal. If it is known that an inactive or abandoned hazardous waste site exists, it must be reported and evaluated. Spills must be promptly reported and cleaned up. Dumping or disposal must follow the mandates of the law. It is the responsibility of the **park superintendent** and **park staff** to find out how the law applies to their situation and to take the necessary actions.

To aid the compliance process every park should have a **hazardous waste coordinator.** The coordinator should be the resource manager, the safety officer, or the maintenance chief. The primary responsibility of the coordinator is, in consultation with all other divisions within the park, to advise park management on applicable waste management laws and regulations. The coordinator prevents future problems as well as dealing with existing ones. The coordinator consults with cultural resources specialists concerning toxic waste management on historic cultural sites. The hazardous waste coordinator should be a source of information for park employees and also act as the official contact when statistics or other information is needed by the regional office, the Washington Office, or the Department. Each park will operate slightly differently, depending on individual circumstances. Some parks and regions have found that a committee works better than a single coordinator in getting the staff involved in environmental compliance as well as protection.

Many of the federal laws discussed in this section are implemented and enforced by state agencies. Recent environmental legislation encourages states to develop and run their own hazardous waste programs as an alternative to direct EPA management. Often the states and EPA act jointly in program management. It is the responsibility of the **resource manager** to find out how environmental protection programs operate in the state and then conduct the natural resource management and protection program accordingly. Each EPA regional office and EPA offices in some states have a federal facilities coordinator who can help explain what needs to be done and assist in making useful contacts at the state level. (Exhibit 3 lists EPA regional federal facility coordinators.)

II. Region

NPS regional offices have a designated **hazardous waste coordinator** who serves as a liaison between the parks and the Washington Office.

III. Washington Office

The Washington Office **Engineering and Safety Services Division** tracks hazardous waste sites and problems in the park system and maintains statistics for budget and other purposes.

IV. Department

Official requests for information from the EPA are usually channeled through the Department of the Interior to the Washington Office and then through the regional hazardous waste coordinators to the parks. The Department's regional environmental officers are also involved, usually representing the Department in decisions on mitigation actions. The Solicitor reviews all legal aspects.

REFERENCES

Musts for USTs. 1988. EPA Manual EPA\530\UST-88\008. Environmental Protection Agency, Washington, D. C.

Progress Toward Implementing Superfund Fiscal Year 1988. 1990. EPA Manual EPA\54018-90\004. Environmental Protection Agency, Washington, D. C.

RCRA Orientation Manual. 1986. EPA Manual EPA\530-SW-86-001. Environmental Protection Agency, Washington, D. C.

Understanding the Small Quantity Generator: A Handbook for Small Business. 1986. EPA Manual EPA\530-SW-86-019. Environmental Protection Agency, Washington, D. C.

CONTACTS FOR THE RESOURCE MANAGER - EXHIBIT 1

1. Hotlines (Toll-Free Numbers)

National Response Center Hotline (NRC)
National Toll-Free Number 800-424-8802
Washington, D.C. Metropolitan Area (202) 426-2675

Parks should contact this hotline to report chemical spills in excess of reportable quantities. Operated by the U. S. Coast Guard, the National Response Center Hotline responds to all kinds of accidental releases of oil and hazardous substances. The NRC Hotline is available 24 hours a day, 7 days a week, every day of the year.

RCRA/Superfund Hotline
National Toll-Free Number 800-424-9346
Washington, D.C. Metropolitan Area (202) 382-3000

Hotline specialists answer regulatory and technical questions and provide documents on all aspects of the RCRA and CERCLA programs. Operating hours for the hotline are Monday through Friday, 8:30 a.m. to 4:30 p.m., Eastern Standard Time (EST).

Chemical Emergency Preparedness Program Hotline (CEPP)
National Toll-Free Number 800-535-0202
Washington, D.C. Metropolitan Area and Alaska
(202) 479-2449

This hotline concerns community preparedness for chemical accidents, Community Right-to-Know Act (Title III). This service is more for information rather than emergency response issues. Calls are handled Monday through Friday, 8:30 a.m. to 4:30 p.m. EST.

National Pesticides Telecommunications Network (NPTN)
National Toll-Free Number 800-858-7378
Texas (806) 743-3091

NPTN provides information on pesticide products, basic safety practices, health, and environmental effects and cleanup and disposal procedures. Service is operated 24 hours a day, every day of the year.

Asbestos Hotline
National Toll-Free Number 800-334-8571, ext. 6741

This service provides technical information concerning asbestos abatement problems. Operates Monday through Friday, 8:15 a.m. to 5:00 p.m. EST.

2. Commercial Numbers to EPA Headquarters

TSCA Assistance Information Service (202) 554-1404

This service provides information on TSCA Regulations, offers regulatory advice and provides publications and audio-visual materials. Service hours are 8:30 a.m. to 5:00 p.m. EST, Monday through Friday.

Control Technology Center Hotline (919) 541-0800

This hotline provides information to state and local pollution control agencies on sources of toxic air emissions. Operating hours are 8:00 a.m. to 4:30 p.m. EST, Monday through Friday.

Public Information Center (PIC) (202) 829-3535

EPA's PIC answers queries on EPA, its programs and activities, and offers a variety of general, nontechnical information materials. You may call or write: PIC (PM-211B), U.S. EPA, 401 M Street S.W., Washington, D.C. 24060.

Chemical Transportation Emergency Center (CHEMTREC)
National Toll-Free Number 800-424-9300
Washington, D.C. Metropolitan Area (202) 483-7616

CHEMTREC is a public service of the Chemical Manufacturer's Association and can provide immediate advice by telephone and assist in contacting the shipper of the hazardous materials involved.

SUGGESTED OUTLINE: PARK EMERGENCY RESPONSE PLAN - EXHIBIT 2

A. Introduction

1. Purpose/objectives of the plan
2. Relationship of the park plan to the regional plan
3. Relationship of the park plan to other federal, state, or local spill prevention and emergency response planning (in the vicinity of the park)
4. National Park Service responsibilities

B. Pre-emergency planning

1. Park spill prevention and emergency response organization
   a. Organization role/functions
   b. Organization composition
   c. Responsibilities of the park spill coordinator and other members of the organization
2. Identification of potential threats to park resources
   a. Inventory of oil and hazardous substances located within and adjacent to the park boundary
      (1) NPS materials
      (2) Materials in other ownership
   b. Inventory of oil and hazardous substances being transported through and/or adjacent to the park
      (1) Material type
      (2) Transportation mode
      (3) Frequency

c. Maintain a record of incidents within and adjacent to the park

(1) Date of incident

(2) Substances involved

(3) Incident cause

(4) Known damage to park resources

(5) Actions taken to prevent recurrence

3. Facility Spill Prevention Control and Countermeasure Plan (SPCC Plan)

NOTE: Facilities referred to here are those that meet the requirements of 40 CFR 112. These plans, required by the Clean Water Act, should be included as a component of the park plan.

a. Purpose/objectives of the SPCC Plan

b. Relationship of the SPCC Plan to the park plan

c. Identify procedures to implement 40 CFR 112, such as:

(1) Maintain an up-to-date inventory of existing facilities under park jurisdiction for which an SPCC Plan is required

(2) Ensure adequate consideration of 40 CFR 112 principles during facility planning and/or design stage

(3) Provide for the timely preparation, implementation, review, and revision of the SPCC Plans

(4) Ensure that the emergency response procedures contained in the SPCC Plan conform to federal/state requirements and are consistent with the park plan and other appropriate local contingency plans

(5) Provide for appropriate instruction of facility personnel about discharge prevention and emergency response procedures

(6) Maintain multiple copies of the up-to-date SPCC Plan at the facility site, park office, and the regional office

4. Coordination with public/private facility within and adjacent to the park

   a. Identify those facilities for which an SPCC Plan is required

   b. Develop procedures for periodic inspection of the SPCC Plan to ensure that it provides adequate protection of park resources and that it provides for prompt notification of the park spill coordinator (park hazardous waste coordinator)

   c. Maintain an inventory, and develop procedures for the use, of those public/private facility materials, equipment, and human resources which would be available to respond to an incident threatening park resources

5. NPS resources available for spill prevention and emergency response

   a. Determine the park resources required to adequately prevent and/or respond to a variety of potential incidents related to perceived threats (as identified above)

   b. Identify the resources that will be acquired and maintained and types of incidents for which park resources will be used

   c. Develop a training program for park personnel which addresses spill prevention and emergency response

6. Utilization of private contractors for emergency response activities

   a. Identify situations that may/do require the use of private contractors

   b. Develop procedures to be followed by private contractors on NPS lands

   c. Maintain an up-to-date list of recommended private contractors

7. Consideration and implementation of measures to minimize harm to park resources from emergency response activities

   a. Identify endangered species/habitat and other sensitive natural resources within the park that may be adversely affected by emergency response activities

   b. Identify sites considered suitable for conducting response support activities

   c. Identify the constraints to the use of equipment and activities within proposed/designated wilderness, special procedures to be followed if wilderness is affected, including the situations requiring the review/authorization by the superintendent/Regional Director

d. Identify known cultural resources that may be adversely affected by emergency response activities, and procedures to ensure compliance with 36 CFR 800 including coordination with the regional archeologist

8. Utilization of volunteers

a. Determine situations where volunteers may/will not be used

b. Identify qualification standards for volunteers

c. Develop a training program for volunteers

C. Emergency response procedures

1. Incident reporting requirements

a. Oil discharge affecting water

(1) Federal requirements

(2) State requirements

b. Oil discharge affecting only land

(1) Federal requirements

(2) State requirements

c. Hazardous substance release

(1) Federal requirements

(2) State requirements

2. Incident reporting procedures

a. In-park reporting

(1) Notification of park spill coordinator

(2) Notification of other appropriate park personnel

b. External reporting (to other agencies)

(1) Notification of the National Response Center

(2) Notification of the appropriate state agency

(3) Notification of the Environmental Protection Agency (if necessary)

(4) Notification of the U.S. Coast Guard (if necessary)

c. Coordination with the regional office

(1) Initial notification of the regional spill coordinator

(2) Follow-up communications and coordination, as necessary, during the emergency response

(3) Regional incident report

3. Public/park personnel safety considerations and procedures

4. Coordination with the regional response team/on scene coordinator

a. Federal response actions involving park resources

b. Federal response actions external to the park

5. Containment of the discharge/release

a. Objectives of the containment strategy

b. Authorized techniques/procedures

c. Actions requiring review/authorization by the superintendent/Regional Director

d. Coordination with the regional archeologist

e. Situations in which private contractors will be used

6. Cleanup of the discharge/release

a. Objectives of the cleanup strategy

b. Authorized techniques/procedures

(1) Use of dispersants/chemicals

(a) Objectives for using dispersants/chemicals

(b) Situations in which approved dispersants/chemicals may be used

(c) Dispersants/chemicals approved for use

c. Actions requiring review/authorization by the superintendent/Regional Director

d. Coordination with the regional archeologist

e. Situations in which private contractors may/will be used

7. Wildlife conservation

a. Objectives of the wildlife conservation strategy

b. Approved procedures for capturing/deterring wildlife

c. Approved procedures for treating/rehabilitating oiled wildlife

d. Coordination with DOI oiled wildlife working group representatives

8. Disposal of discharged/released material

a. Identify situations which require the use of private contractors

b. Develop procedures that conform to federal/state disposal requirements

9. Assessment of impact/damage to park resources

a. Purpose/objectives of the assessment

b. Assessment procedures

10. Incident documentation and cost recovery

a. Purpose/objectives of incident documentation

b. Documentation procedures

D. Post-emergency responsibilities

1. Required written reports
2. Incident review by park spill response team and other appropriate park or regional office staff
3. Consideration and/or application of the DOI damage assessment process

E. Appendix (suggested contents)

1. Current appropriate federal regulations
2. Current appropriate state regulations
3. EPA hazardous substances reportable quantities
4. Interagency emergency contacts
5. Directory of private contractors
6. Technical assistance information
7. Information sources
8. Inventory of facilities requiring SPCC Plans
9. Directory of qualified volunteers/organizations
10. Current schedule of training courses/workshops

ENVIRONMENTAL PROTECTION AGENCY REGIONAL FEDERAL FACILITY COORDINATORS - EXHIBIT 3

Federal Facilities Coordinator
U. S. EPA Region I
Boston, MA 02203
(FTS) 223-4958 or
(617) 223-4958

Federal Facilities Coordinator
U. S. EPA Region II
26 Federal Plaza, Room 702
New York, NY 10278
(FTS) 264-5390 or
(212) 264-5390

Federal Facilities Coordinator
U. S. EPA Region III
841 Chestnut Street
Philadelphia, PA 19107
(FTS) 597-1168 or
(215) 597-1168

Federal Facilities Coordinator
U. S. EPA Region IV
345 Courtland Street, N.E.
1327 Atlanta, GA 30365
(FTS) 257-3776 or
(404) 331-3776

Federal Facilities Coordinator
U. S. EPA Region V
230 South Dearborn Street
Chicago, IL 60604
(FTS) 353-1394 or
(312) 353-1394

Federal Facilities Coordinator
U. S. EPA Region VI
1201 Elm Street
Dallas, TX 75270
(FTS) 729-6659 or
(214) 767-6659

Federal Facilities Coordinator
U. S. EPA Region VII
726 Minnesota Avenue
Kansas City, KS 66101
(FTS) 757-2823 or
(913) 236-2823

Federal Facilities Coordinator
U. S. EPA Region VIII
One Denver Place, Suite 1300
999 18th Street
Denver, CO 80202-2413
(FTS) 564-1644 or
(303) 293-1644

Federal Facilities Coordinator
U. S. EPA Region IX
215 Fremont Street
San Francisco, CA 94105
(415) 974-7539

Federal Facilities Coordinator
U. S. EPA Region X
1200 6th Avenue
Seattle, WA 98101
(FTS) 399-1327 or
(206) 442-1327

(These numbers correct as of 1/91)

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EXHIBIT 2 381

PUBLIC HEALTH AND SAFETY

Public health and safety are primary concerns in all NPS management activities. This section provides specific guidance on hazardous animals, hazardous trees, noxious plants, disease vectors, disease outbreaks and epizootics, and radon. All statements regarding the protection of health and safety of visitors apply equally to NPS employees and others working in parks. References for Hazardous Trees, Noxious Plants, and Disease Vectors are listed at the end of the section.

POLICY AND PROGRAM OBJECTIVES

The following statement from NPS Management Policies applies to all subsections of Public Health and Safety. More specific policies will be found in subsections to which they apply.

> The saving of human life will take precedence over all other management actions. The National Park Service...will seek to provide a safe and healthful environment for visitors and employees....However, park visitors assume a certain degree of risk and responsibility for their own safety when visiting areas that are managed and maintained as natural, cultural, or recreational environments.
>
> The National Park Service will strive to identify recognizable threats to the safety and health of persons and to the protection of property....Where practicable and not detrimental to NPS mandates to preserve park resources, known hazards will be reduced or removed. Where it would be inconsistent with congressionally designated purposes and mandates or where otherwise not practicable to make physical changes, efforts will be made to provide for persons' safety and health through other controls, including closures, guarding, signing, or other forms of education. The National Park Service recognizes that the environment being preserved is a visitor attraction but that it also may be potentially hazardous. (8:5-6)

Integrated pest management policies apply to health and safety matters that are related to natural resource management.

HAZARDOUS ANIMALS

In some situations, animals may be considered hazards to public health and safety. "Hazardous" animals are usually dangerous as individuals within specific contexts (e.g., in a developed zone) or under predictable circumstances (e.g., when sick, injured, or when protecting young). For example, a rattlesnake in a picnic ground could be considered a hazard and removed, while in the backcountry it would simply be avoided.

Many types of animals may be considered hazardous, such as biting and stinging insects, poisonous reptiles, poisonous marine and freshwater animals, feral animals, and certain large animals known to attack humans. Examples are bees, wasps, scorpions, spiders, snakes, gila monsters, jellyfish, feral dogs, alligators, and bears.

Animals that are directly hazardous are covered here. Animals that are indirectly hazardous through their potential to transmit disease are discussed under Disease Vectors, below. Since they comprise a special concern in many parks, bears are addressed separately in a more comprehensive discussion following these general guidelines.

DEFINITIONS

Hazardous animals Animals capable of injuring humans and, at least at times, documented to have done so.

Nuisance animals Individuals or populations that cause damage to property or interfere with human activity or use of specially designated or zoned areas.

POLICY AND PROGRAM OBJECTIVES

It is NPS policy to "perpetuate native animal [populations] as part of the natural ecosystems of parks." (4.5) Individual animals may be controlled or removed only for specific reasons, one of which is to protect human safety and health. (4:6) When control or removal is necessary, hazardous animals should be considered as "pests" and integrated pest management (IPM) techniques will be used in designing action plans for the control of hazardous animals. (4:13)

AUTHORITIES

Management of hazardous animals is directed by a variety of general authorities, and may specifically be addressed in the enabling legislation for any given park. General regulations and policies regarding hazardous animals are found in the discussion of natural resources management in Management Policies (Chapter 4). Guidance on wildlife protection is found in 36 CFR, especially sections 2.1 (a) and 2.2 (a). Some species (e.g., grizzly bears) are protected in places under the specific provisions of the Endangered Species Act of 1973 and its 1988 amendments.

RELATIONSHIP TO OTHER GUIDANCE

In this Guideline, see Chapter 2, Native Animal Management, Freshwater Resources Management, Marine Resources Management, Integrated Pest Management, and Exotic Species Management; Chapter 3, Backcountry Recreation Management; and Chapter 5, Certification.

PROGRAM GUIDANCE

Each park should have a trained, experienced staff able to make objective determinations as to the nature and extent of the threats which an animal might pose in a specific context, and be prepared to implement sound and effective procedures to resolve hazardous animal situations. Each park should gather sufficient knowledge of its native fauna to be able to identify potentially hazardous animals and take steps to resolve conflict situations. Where potentially dangerous species (e.g., bears) are present in sufficient numbers to make conflicts with humans likely, the park should establish a plan outlining the various kinds of responses it will take and designating the personnel to be involved.

Below are general guidelines recommended as steps to follow in addressing potential hazardous animal situations.

I. Prevention

Prevention involves anticipating human-wildlife encounters and establishing plans to deal with them. Avoiding or preventing human-wildlife contacts will be emphasized as the preferred method in controlling potentially hazardous situations. Where human-animal conflicts are probable and/or unavoidable, the public should be cautioned and informed about risks.

Sometimes it is possible to prevent dangerous situations by separating people and animals. This requires knowledge of the habits and requirements of individual species (both people and animals) in order to design preventive measures. Examples are putting snake-proof fencing around affected areas, closing waters for swimming when poisonous jellyfish occur, and removing bee colonies in areas of high visitor use.

II. Public Information and Notification

Public education is critical. Parks should conduct public education programs through media contacts, handouts, audio programs, signs, warnings, personal contact, and other methods as necessary to address specific situations. Specific information should be prepared for special park concerns. For example, some parks may express concerns about avoiding poisonous snakes, while others might address concerns about scorpions, bison, or other species.

III. Record Keeping

Incidents of human-wildlife encounters will be recorded for use in prevention planning and will be tracked to develop and refine problem responses. Among the information collected should be details about the location of incidents, the wildlife species involved, and the individuals affected.

IV. Monitoring and Surveillance

Monitoring the frequency and extent of incidents will help staff determine the appropriate responses and response levels. Monitoring data may indicate needs for research and refined surveillance procedures, and should serve to document such requirements. (See Chapter 5, Inventory and Monitoring.)

ROLES AND RESPONSIBILITIES

The **superintendent** is responsible for dealing with hazardous human-animal encounters in a manner consistent with NPS regulations and policies and in accordance with approved procedures. Usually, the responsibility for preparing specific procedures belongs to the **resource manager. Ranger staff** ordinarily have the responsibility to carry out these procedures. **Park or regional science staff** should design research, monitoring, surveillance, and documentation programs.

BEAR MANAGEMENT

I. Introduction

Black bears occur in forested areas throughout the U.S. Grizzly bears occur in Glacier, Yellowstone, Alaskan parks, and surrounding areas. Very small populations of grizzly bears are also suspected to occur in the North Cascades, northern Idaho, and possibly central Idaho.

The opportunity to see a bear contributes significantly to most visitors' enjoyment of a park, but all bears are capable of injuring people and damaging property. This capability presents a challenge for management to preserve bears as an integral component of the ecosystem while providing for reasonable safety of people.

II. Definitions

Incident An event in which a bear exhibits aggressive behavior toward people or damages their property.

Conflict A generic and cumulative reference to all types of incidents.

III. Objectives

The objectives of bear management in a park with a resident bear population should be:

1. to retain the population of bears as part of a diverse ecosystem, allowing their natural patterns of feeding and habitat use, their natural mechanisms of population regulation, and their ecological relationships with other species to continue unimpeded;

2. to preclude the learned orientation of bears toward people; and

3. to provide opportunities for visitors to enjoy, understand, and appreciate bears while minimizing confrontations between bears and people.

IV. Management Zones

Management objectives usually differ between developed areas and other areas intended to have high levels of human activity, and natural zones.

Effort should be made to exclude bears from developed areas. This is usually most effective when it combines passive methods incorporated into the location and design of the developed area with active efforts to ensure that no food or garbage is accessible to bears in or adjacent to the developed area.

V. Program Guidance

An understanding of bears as potential hazards can derive from consideration of the following five elements.

1. **Innate characteristics of the species and the individual animal.**

   Understanding the interactions between bears and their environment is essential to understanding bear-human interactions and formulating management plans. Black bears behave differently toward people than do grizzly bears. When black bears feel threatened, they generally retreat into the safety of the woods or up a tree. Grizzlies, on the other hand, will attack in an explosive display of ferocity to frighten away the attacker. It is theorized that these differences in behavior are related to the different habitats in which the two species evolved: black bears in forest, grizzly bears in the open habitats.

   The most important influence on bears' reproductive rates is nutrition. Nutrition affects litter sizes, the interval between litters, and the age at first reproduction. While reproductive rates are determined by nutrition, mortality rates are largely the product of accidents, encounters with people, including hunters, and encounters with other bears. Bears are anti-social and, under most circumstances, an individual bear will not tolerate the presence of another bear. When given the opportunity, adult male bears kill young bears.

   With their large body size and primarily vegetarian food habits, bears travel widely in their search for food. Bears are opportunistic, seeking any food that is easy to acquire.

They are also intelligent, and remember good sources of food. It is to a bear's advantage to find a concentrated source of high-protein or high-calorie food. At sites such as berry patches, garbage dumps, or salmon-spawning streams, a bear may tolerate the presence of other bears in order to have access to the food. Nevertheless, the bears continue to present a clear danger to each other, and small bears give large bears a wide berth.

The primary sense that bears use to perceive the world around them is their sense of smell. Secondarily they use their sense of hearing. Odors and sounds are affected by weather and vegetation. Although bears' eyesight is not as poor as commonly thought, it does not compare to their phenomenal sense of smell.

2. **Intersection of human activity and bear activity.**

Encounters between bears and people are most likely to occur where high levels of human use occur in areas of high-quality bear habitat.

3. **Behavior learned by an individual bear through experience.**

The two types of learning critical in bears' interactions with people are **habituation** and **conditioning**. Habituation is the capability that all animals possess to varying degrees to become accustomed to routine aspects of their environment. Where areas with high human use overlap good bear habitat, the presence of people becomes a routine aspect of the bears' environment. In order to use the habitat, a bear must be able to tolerate the presence of people; i.e., to habituate to them. Bears that are unable to tolerate the presence of people are excluded from the habitat.

Conditioning is a learned association. With bears' intelligence and capacity to learn, they readily form associations between the presence of people or developed areas and the likelihood that food will also be present and available. Conditioning can take place independently of habituation.

4. **Situational encounters.**

Confrontations between bears and people most often occur in the following situations:

a. **Surprise close-range encounters.** If a bear suddenly encounters a hiker at close range, it may or may not immediately recognize what the person is. If the bear perceives the human as a threat, it may run away. However, if the bear perceives that it cannot escape, it may rush at the person. Such a charge may result in physical contact with the person, but injury is rarely severe. Females with cubs are particularly likely to view intruders as threats and to charge when

encountered. A bear involved in this type of encounter is likely to avoid situations in which a recurrence is probable.

b. **Food-related confrontations.** A bear may be attracted by the smell or sight of people's food or garbage, or it may have learned through experience that the presence of people, a campsite, a car, or a developed area is likely to mean that food is available. A bear that has, in the past, learned to associate people or their equipment with food may seek out additional opportunities to obtain food. It may persistently approach people or damage their equipment, even when no food is actually present. It is thought that most bear-inflicted fatalities and severe injuries to campers involve bears that have had experience in obtaining people's food or garbage.

c. **Bear defending a carcass.** The carcass of a dead animal represents a bonanza of high-protein food for a bear. A bear that finds a carcass is likely to defend it very aggressively.

d. **Predatory encounter.** Rarely, a bear may attempt to prey on a person. This type of incident is so rare that it is not well understood. Predatory incidents have involved black bears, grizzly bears, and in Alaska, polar bears. Most incidents involving black bears have occurred in very remote areas, where the bears may never have encountered people before. Incidents involving grizzly and polar bears have occurred in a variety of locations.

5. **Human response during encounters.**

While the behavior of bears is very different in different types of encounters, the responses of people are also known to influence the outcome of encounters. For example, in a surprise close-range encounter, the people involved should help the bear to identify them as humans and minimize their appearance as a threat. If the bear makes physical contact in such an encounter, people who curl up and play dead are likely to sustain much less injury than those who fight back. On the other hand, when people are approached by a bear seeking food it is clearly not advisable for them to play dead. They should leave the scene, climb a tree, or, conversely, behave aggressively toward the bear.

A. Bear Management Plan

All parks inhabited by resident populations of bears should prepare a bear management plan which identifies objectives, potential sources of conflict, ways in which conflict will be minimized, procedures for responding to incidents, and staff responsibilities. The bear management plan should be reviewed annually and updated as needed to incorporate new information and to refine the

program to improve its effectiveness. The state wildlife management agency and the U.S. Fish and Wildlife Service (FWS) should be given an opportunity to review and comment on the draft plan and any revisions.

Management can be divided into two categories:

1. Preventive management focuses on preventing confrontations. Management programs should give strong emphasis to prevention since, if it fails, the result is impact on the resource and/or injury to people or damage to their property.

2. Responsive management is management that occurs in response to an incident or problem bear.

B. Preventive Management

Preventive management should focus on the five elements, listed above, which contribute to hazardous bear situations. The following are components of preventive management.

1. Employee Training

All NPS and concession employees should receive training in bear safety and expected behavior toward bears. Interpretive and protection rangers should be trained in the biology and behavior of bears and in bear management policy and practices.

A sufficient number of employees to provide coverage should be certified in the use of immobilizing equipment and firearms, in accordance with NPS-44, the Personal Property Management guideline, NPS-9, the Law Enforcement guideline, and in this Guideline, Chapter 5, Certification. To be qualified to carry or use immobilizing equipment or firearms for use in bear management, employees should receive authorization upon successful completion of a program that includes the following:

- firearms training and qualification test administered in accordance with NPS-9 and NPS-44;

- demonstrated familiarity with the bear management plan;

- observation of bear management actions involving the use of immobilizing equipment and/or firearms by fully qualified employees; and

- assisting in bear management actions involving use of immobilizing equipment and/or firearms under the direct supervision of a fully qualified employee.

2. Visitor Information

Human safety and, ultimately, preservation of the bear population depend on well-informed and conscientious behavior by people. Most visitors are interested in bears, and interpretive efforts should build on this interest. Interpretive programs should enhance appreciation for bears and motivate people to make the extra effort needed to minimize conflicts.

All uniformed and other park employees, as well as concession employees, should be sufficiently knowledgeable about bears and park policies to be able to inform visitors about proper behavior in relation to bears. Interpretive brochures, articles, exhibits, programs, presentations, and informal communications should include, as appropriate, information on:

- bear ecology and behavior
- causes of conflicts between bears and people
- the bear management program
- proper behavior in relation to bears
- proper techniques of food storage and garbage disposal in developed and backcountry areas
- responsibilities for food storage and garbage disposal
- regulations
- consequences of feeding bears
- consequences of failing to properly store food or dispose of garbage
- how to avoid confrontations on day-hiking trails and in backcountry areas
- how to avoid food-related encounters in the backcountry
- appropriate behavior if an encounter occurs
- the current bear management situation, including current closures or advisories

Interpretive messages should be directed to all people entering the park. Examples include:

- prospective visitors planning a trip
- visitors entering the park
- visitors at visitor centers
- visitors at evening programs
- guests or customers at concession facilities
- motorists, who may or may not stop at wayside exhibits
- campers in frontcountry campgrounds
- visitors on ranger-led walks
- day-hikers
- backcountry hikers/campers
- outfitters
- other commercial users
- clients of commercial users

- NPS employees (updates)
- new seasonal and permanent employees
- concession employees
- NPS and concession employees' families
- contractors
- researchers
- fire crews
- volunteers
- people from other parks, regional offices, other agencies, or organizations who visit the park for a short period
- park neighbors

Warning notices should be placed to advise visitors of existing risks in areas where incidents have occurred or where an increased likelihood of an incident is expected. In such areas, roving patrols and intensive interpretation should be used to help ensure that food is kept secure from bears. All interpretive handouts should be reviewed annually to ensure that they are accurate and incorporate the most up-to-date information available.

3. Regulations

Regulations found in 36 CFR are important tools in bear management. Perhaps most important is 36 CFR 2.10(d), which provides for the superintendent to designate all or portions of a park where food, food-preparation equipment, garbage, and harvested game and fish must be stored using procedures specified in the Compendium of Superintendent's Orders. Other regulations provide for designation of camping and picnicking areas, authorize visitor-use permits and closures, and prohibit feeding of wildlife.

4. Facility Location

Visitor-use patterns should be managed to minimize the amount of overlap between areas with high human use and areas with high bear use. This applies to the location of frontcountry developments, layout of the trail system, and the location of backcountry campsites. New facilities should be placed outside of high-quality bear habitat to avoid inviting confrontations and continuing management problems. Trails should be relocated where necessary to avoid high-quality bear habitat.

Seasonal closures and openings of trails and backcountry campsites may be used to accommodate seasonal cycles in bear habitat use. It should be recognized that even the best layout of facilities will not eliminate encounters between people and bears traveling through their range and between areas of high-quality habitat.

5. Facility Design

Facilities can be designed to help reduce encounters. Fencing which is not bear-proof can help redirect the unfocused movement of a bear that may wander through a developed area. Separation of food storage, preparation, and eating areas from other areas will reduce the likelihood that bears will be attracted to people's sleeping areas or other human-use areas.

6. Control of Food

Control of human-generated food and garbage is essential to minimize the attractiveness of human-use areas to bears. Unsecured food or garbage must not be left unattended at any time. (See Regulations, above.)

Bear-proof and bear-resistant food storage methods take advantage of the opportunistic nature of bears. Their intent is to make it more difficult for a bear to acquire human food than its natural food. This, in turn, will preclude bears from learning that developed areas, campsites, or the presence of people indicate that food can be obtained.

All outdoor garbage cans and dumpsters should be designed to be bear-proof. Any design which is found to be too complicated for proper visitor use or otherwise ineffective should be replaced with a design known to be successful. Steps should be taken to ensure that garbage containers are not allowed to overflow.

Steps should be taken to ensure that no food is available to bears as a result of concession activities or at residences of NPS or concession employees, inholders, or others. Pet food should not be left outdoors, and leftovers from barbecues and other activities should be cleaned up immediately. Efforts should be made to minimize the amount of garbage generated. Where possible, garbage disposals should be installed in employee residences and concession facilities.

Bear-proof food storage should be provided in frontcountry campgrounds and in backcountry areas where the level of incidents indicates they are needed. Methods of bear-proof food storage include lockers, poles, cables, canisters, and elevated cables.

When campgrounds are located in heavily used grizzly bear habitat and cannot be relocated, campers' sleeping areas should be separated from food storage areas. Patrols and intensive interpretation should be used to help ensure that food is kept secure from bears.

All backcountry users should be instructed in and required to use proper food storage methods to ensure that their food is not accessible to bears. These methods may include using the counter-balance method to suspend their food or use of portable bear-proof food-storage canisters approved by the superintendent. In areas where hunting or fishing is permitted, procedures should be instituted to ensure that bears do not have access to game carcasses or caught fish. Bear-proof

food storage should be a condition of outfitters' commercial use licenses or permits. When outfitters realize that careless behavior by others can set them up for a dangerous encounter with a bear, peer pressure can enhance compliance.

Open dumps should not exist in parks unless electric fencing or other methods are used to make them absolutely bear-proof. Even when a source of food is cleaned up, problems with bears may persist at the site. This can be attributed to bears' ability to remember good sources of food and their long life spans. Consequently, the effects of past management, both in and out of the park, can be long-lasting.

7. Minimizing Encounters While Hiking

To avoid a surprise close-range encounter with a bear, people should take care to make noise whenever they travel outside of a developed area within areas inhabited by grizzly bears. The objective is to ensure that no bear in the area, even a bear that is sleeping or feeding in the brush, can ignore the fact that a person is coming. It is essential that the noise be identifiable as indicating a person. Good ways to make noise include shouting and/or clapping, but the most effective way to consistently make noise is to use loud bells. Bells have been shown to considerably reduce the likelihood of dangerous encounters. Hikers should be encouraged to use loud bells, and employees should set an example by using them.

Predictability can also reduce surprise encounters. People who hike off-trail or on remote wilderness trails or who hike at night, dawn, or dusk are more likely to surprise a bear than people who hike on heavily used trails during the middle of the day. Moving quickly and quietly, such as when jogging or bicycling, predisposes people to a surprise close-range encounter.

8. Boundary Influences

Bears' movements across park boundaries present a challenge to management. Even if all potential sources of food and garbage within a park are secured from bears, sources may exist on adjacent lands or inholdings, jeopardizing the safety of visitors in the park. Activities outside of the park which generate reliable sources of food can result in higher bear numbers than occurred previously. Examples of such activities are management of commercial salmon fisheries, designed to ensure consistent returns of fish, as well as agricultural crops and orchards. This may affect populations of other species upon which the bears feed, and lead to relatively high numbers of bears.

Hunting can also lead to high bear densities in or adjacent to an NPS unit. If hunting results in a reduction in the average age in a population, it may actually increase the number of bears. This occurs when the large adult bears which regulate the population are removed, resulting in increased survival of young bears. Since young bears tend to be involved in a disproportionate number of confrontations with people, the frequency of confrontations may increase.

It is imperative that superintendents work with adjacent landowners and commercial operators to gain their support in securing all food and garbage from bears, as well as addressing overall concerns for management and regulation of the bear population in areas surrounding the park. Interpretive outreach programs can contribute to this effort. Superintendents must also work with inholders to control possible bear access to human food sources. Where cooperative agreement with inholders cannot be reached, the NPS has authority (under the NPS Organic Act) to pursue appropriate protective actions concerning activities that adversely affect native animal populations or jeopardize park visitors. (Also see 36 CFR 2.1 and 2.2.)

C. Responsive Management

If, in spite of preventive management, an incident occurs or seems likely, action must be taken to assess the situation and minimize the chance of occurrence or recurrence. Where persistent human/bear conflict problems exist, a determination will be made as to whether or not curtailing or modifying human or bear activities might be a more desirable alternative. The following activities are components of responsive management.

1. Posting

If visitors may still enter the area, warning notices should be posted to inform them of the unusually high risk of encountering a hazardous bear.

2. Travel Restrictions

If an incident seems likely or if an incident has occurred and the bear may still be in the area, visitor use of the area should be restricted. Restrictions may consist of:

- closure to all entry;
- entry only for passage through the area, but no camping or eating permitted within the closed area; and/or
- closed to camping but open to hiking.

As discussed above, a bear that charged in response to a surprise close-range encounter is likely to immediately leave the area where this occurred and to avoid a recurrence of such an encounter. On the other hand, a bear that acquired human food is likely to seek out a recurrence of such an opportunity. If patrols indicate that the bear is likely to have left the area, the area may be reopened.

3. Aversive Conditioning

In some situations, aversive conditioning of a bear may be the only viable option to prevent an incident from occurring or recurring, short of destroying the bear. Aversive conditioning is an effort to teach a bear that a certain behavior has unpleasant consequences. It must be used with precision in order to be successful.

The objective of the conditioning must be clearly defined. It may be to teach a bear to fear people, to discourage it from entering a developed area, or to make it distrustful of people's food. Conditioning is very specific. For example, teaching a bear to avoid people may not affect its propensity to obtain people's food but may simply teach the bear to be furtive.

When conditioning is applied, it is imperative to control the variables to ensure that the bear focuses on the salient aspect of the experience that it is being conditioned against. A situation consists of many components. If a bear is aversively conditioned when it enters a campground, it may associate the conditioning with the appearance of people rather than the act of entering the campground.

Aversive conditioning is applied to only one bear at a time. Even when aversive conditioning is successful with a given bear, if the circumstances that led to its unacceptable behavior continue to exist other bears are likely to repeat it.

Aversive conditioning must be consistently applied. One exposure to an aversive experience will rarely outweigh a single experience of obtaining people's food. If, when a bear enters a developed area, it obtains food four times and is aversively conditioned twice, it is likely to continue entering the developed area. If it can detect clues that indicate when aversive conditioning will occur, it will avoid those circumstances but will not avoid the developed area.

Aversive conditioning should be critically evaluated to determine whether its cumulative effects are consistent with park purposes. For example, if it is used to increase bears' fear of people, it may exclude bears from significant areas of important habitat that happen to be heavily used by people. Aversive conditioning may also have unexpected results. Again, if it is used to increase bears' fear of people, then when a bear does encounter people, it may be more likely to panic, increasing the likelihood that people will be injured.

Methods to deter or repel a bear from an area include clapping and yelling at the bear. Delayed-action firecrackers ("shell crackers") shot from a shotgun may also be used. However, a bear that is repeatedly exposed to such noise-makers will quickly habituate to them, and they will lose their effectiveness.

Techniques which involve a physical impact against the bear are more effective. They should be used only by uniformed employees who are well-trained in bear behavior (refer to Employee

Training, above). These methods include use of rocks, slingshots, or projectiles shot from a firearm. Firearms should be used only with great discretion and care to ensure safety of visitors, employees, and the bear. The action must be discussed with any visitors who are present.

Several types of projectiles are available. They vary in their flight characteristics and the range at which they are most effective. It is useful for a team of two trained people to carry out the action: the "shooter," who concentrates on the bear and on placement of the shot, and the "decision--maker," who concentrates on the surroundings, including the likely direction in which the bear will move.

In the past, birdshot has been used in aversively conditioning bears. To avoid contaminating the environment with lead and because of the propensity of birdshot to pierce the skin, its use is no longer approved.

If a program of aversive conditioning is used in a park, documentation and analysis should be undertaken to evaluate its effects. All attempts, successful or unsuccessful, to apply aversive conditioning should be documented.

4. Immobilization

A bear may be immobilized for the purpose of marking for future identification by managers or researchers, relocation, or destruction.

All employees and cooperators involved in immobilization must be trained, qualified, and certified in accordance with the guidance in Chapter 5, Certification. Capture and immobilization must use the most humane methods possible, preferably using the advice of a veterinarian retained as a consultant. The drug(s) to be used should be selected in consultation with wildlife professionals and/or a veterinarian.

A bear may be captured using a culvert trap, snare, or a drug-injecting dart as appropriate for the situation. Care should be taken during capture programs not to separate family groups for such periods as would reduce their chances of reunion. The capture operation should be carried out in a way that ensures, to the greatest extent possible, the safety of visitors, employees, and the bear. The action must be discussed with any people who are present. The immobilized bear should be kept in as quiet a place as possible until it recovers.

Once a bear is drugged, the involved employees are responsible for taking every step possible to ensure its safety until recovery, unless it is to be intentionally destroyed. They should monitor its vital signs, be trained in administering first aid, and be cognizant of hazards such as drowning and attack by another bear. If possible, the recovering bear should be held in a culvert trap until it is functioning normally.

A bear which is not to be relocated should be released within one-half mile of the capture site. To avoid disturbance and confusion of the bear and ensure public safety, releases should occur out of public view.

5. Relocation

Relocations of problem bears typically have low success rates. Radio-monitoring has shown that relocated bears either attempt to return to the site from which they were moved or travel into an area where they are killed. Nevertheless, relocation may be the only alternative for a bear that has been involved in unacceptable conflicts with people, such as persistently seeking food in a frontcountry campground or along a roadside. The intent of relocation is to move the bear away from the situations in which it has learned to seek food from people.

The following information should be utilized to maximize the likelihood of success in relocations:

- The bear should be moved as great a distance as possible.
- The release site should be outside of the bear's home range.
- Topographic barriers between the release site and the capture site should be as extreme as possible. Bodies of water do not constitute barriers to a bear; very steep, rugged topography often does.
- There should not be opportunities near the release site for the bear to have the same sorts of conflicts with people as occurred in the capture area.
- Vegetation in the vicinity of the release site should be as similar as possible to that of the capture site.
- A full range of seasonal habitats should be present in the vicinity of the release site.

To provide for positive future identification, each relocated bear should be marked, such as with unobtrusive ear tags. To evaluate the effectiveness of relocations, each relocated bear should be radio-monitored, if possible.

6. Destruction

Rarely, it may be determined that the continued existence of an individual bear poses an unacceptable hazard to human safety. Specific criteria should be established in the park's bear management plan. These may include:

- A bear that injures a person in an attempt to obtain the person's food.

- A bear that persistently damages property where food has been properly stored.
- A bear that frequently bluff-charges or chases people.
- A bear that injures or kills a person in an unprovoked attack.

A bear that injures a person in a surprise close-range encounter should not be destroyed nor, generally, relocated. Unless human safety is in immediate jeopardy, a bear should be destroyed only with prior authorization of the superintendent, in consultation with a bear management committee. The FWS should be consulted prior to destroying a grizzly bear in the contiguous 48 states. The state wildlife management agency may also wish to be informed when a grizzly or black bear is destroyed. A bear that is to be destroyed may be drugged first and then shot, killed with a euthanizing drug, or shot while free-roaming, depending on considerations of safety and humaneness. Except in an emergency, a bear should not be destroyed in public view.

The carcass of a destroyed bear should usually be disposed of away from public roads, trails, and developed areas, where the smell will not be offensive, where scavenging wildlife will not itself present a hazard, and where people cannot pilfer the carcass for souvenirs or body parts. State wildlife management agencies, NPS, or non-NPS scientists may have an interest in the skull or other body parts. Such interests should be accommodated when they are associated with legitimate research purposes and are not otherwise in conflict with NPS policy.

7. Documentation

Whenever an incident occurs, it should be documented. The investigation should identify contributing factors. If possible, effort should be made to eliminate factors that contribute to incidents. Records should be maintained on all incidents that occur, violations of regulations related to protection of bears, and management actions taken.

D. Monitoring and Research

The effectiveness of current management practices in accomplishing bear management objectives should be monitored. The effects of current management on the bear population, including patterns of habitat use, trends in abundance, sex and age ratios, and behavior, should be monitored.

Research should be carried out to provide information needed in developing and refining the program and to better understand the effects of visitor activities and current management on bears' ecological relationships.

VI. Roles and Responsibilities

A. Park

The **superintendent** is responsible for the bear management program, for any decision to destroy a bear, and for setting a tone of teamwork and cooperation in bear management. The superintendent is responsible for ensuring that new facilities are planned and located in a way that will minimize conflicts with bears. The superintendent also approves the design and adoption of bearproof canisters.

The **resource manager** is responsible for overseeing and coordinating bear management programs, and monitoring the effects of current management. He/she works cooperatively with the **chief ranger** in providing training and certification of employees and in carrying out bear management actions. The resource manager is also responsible for identifying research needs, incorporating up-to-date scientific information into the bear management plan, and transmitting pertinent information to other division chiefs, as well as working cooperatively with the chief of interpretation in communicating accurate and up-to-date information, and working cooperatively with the chief of concessions.

Park or regional wildlife scientists are responsible for conducting research needed for management and for developing monitoring to assess bear activity and management actions. Parks may contract these tasks through the regional chief scientist with Cooperative Park Study Units or other research units.

The **chief of concessions** is responsible for working with the concessioner to elicit compliance with the park bear management program, to ensure that concession employees receive bear training, and to encourage concession employees to participate in communicating accurate information on bears and bear management to visitors.

The **chief of interpretation** is responsible for developing and implementing an interpretive program that is as effective as possible in preventing conflicts.

The **chief ranger** is responsible for ensuring compliance with regulations and other measures aimed at preventing incidents, and, in cooperation with the resource manager, for carrying out responsive management actions which address the causes of incidents.

The **chief of maintenance** is responsible for ensuring that solid waste disposal, garbage collection, and sewage treatment operations are carried out in a manner that does not generate conflict with bears. Maintenance is also responsible for providing and maintaining adequate food-storage facilities.

The **chief of interpretation** is responsible for coordinating and implementing a cohesive interpretive program on park bears.

All division chiefs and supervisors should provide opportunities for employees to attend training in bear biology and behavior, bear management policies and regulations, and proper behavior in relation to bears. Each division chief or project supervisor is responsible for providing bear information to people working under their direction, whether permanently, temporarily, or for brief projects. All park and concession employees are responsible for ensuring that their activities are consistent with the bear management plan and do not contribute to conflicts with bears.

HAZARDOUS TREES

Extensive portions of parks contain trees as natural or landscape components. Among the trees may be manmade developments with accompanying visitor activities. This poses the risk of damage to property and injury to visitors from tree failure. Even though any tree or portion of a tree may present some degree of risk or hazard to visitors, employees, and property simply by its proximity, in most cases only such trees (and other vascular plant forms such as large cacti) that are determined to possess a significant flaw or structural defect may be deemed hazardous. The purpose of this section is to outline a hazardous tree program (HTP) that provides the foundation for each park to implement its own hazardous tree management plan (HTMP), and also to provide a general scheme for such plans. The need for these plans arises from the responsibility of the NPS to reasonably protect visitors as invitees to parklands. Failure to do so could make the NPS liable. A deliberate effort by the NPS to manage for hazardous trees will reduce the risks and liability by avoiding vulnerability to claims of negligence or breach of duty.

DEFINITIONS

Hazard A potential risk from the physical presence of a woody plant. By contrast, **hazardous** should specifically refer to a plant with a significant flaw which, when coupled with a location in an identified public use area, makes that tree an actual risk. Thus a **hazardous tree** is one that, because of a recognizable mechanical flaw, poses a threat to people or property. Plants that contain toxins, irritants, or even addicting drugs should not be termed hazardous but **noxious.**

Negligence Failure to take responsible action to adequately protect visitors. Liability for damages from hazardous trees commonly revolves around the determination of whether the NPS was negligent in its programmatic approach to managing hazardous trees. There are four elements which together constitute negligence:

1. There must be a legal duty or obligation requiring the agency to conform to a standard of conduct to protect the visitor against unreasonable risks. The responsibility of the agency to the visitor may generally be defined as using "ordinary and reasonable care

to keep the premises reasonably safe for his visit and to warn him of any hidden danger" (Smith v. U.S., 1974).

2. There must be a failure (breach of duty) to meet the standard.

3. There must be an establishable connection between the action (or inaction) and the resulting injury or damage.

4. There must be a definable injury or damage level.

Invitee The traditional visitor or worker who, in effect, enters park lands by expressed or implied invitation. As the steward of park lands, the NPS is obliged to exercise reasonable care for the safety of invitees during their visit. Other users of the land who are not invited are not owed the same level of protection. Examples of the latter include people who enter a park or park area that is closed and poachers.

Target The object, structure, or person that potentially may be hit or impacted by a falling tree or tree part.

PROGRAM OBJECTIVES

The NPS must seek to implement an HTP that will reasonably protect visitors from unnecessary risks resulting from hazardous trees. The program should be directed toward the public welfare while simultaneously avoiding a posture of negligence. A hazardous tree reduction program provides a systematic method for mitigating tree hazards to avert damage to people or property. The problems should address the areas of visitor use, landscape management, interpretation and transportation corridors (such as parking lot, walkway, visitor center, campsite, picnic ground) which the public is openly invited or requested to use. The program is not applied to wild or natural areas away from trails or shelters.

The inherent decision-making challenge in addressing hazardous trees is to preserve and sustain healthy trees as components of the park's natural systems, while treating or removing trees with discernible defects which represent risks to the public or property. The attitude when inspecting a tree must be: Can this tree be reasonably retained as a vital component of the natural system? If not, should the tree be removed? The action to be taken should result from an evaluation of the tree as a functional and aesthetic component of the landscape, in addition to its potential hazard.

There may be situations where particular weather or site conditions can make a group or section of trees in a public activity area hazardous. A system of notification or warnings may be warranted in such cases. Where or when a hazardous condition exists it may be necessary to close an area until the hazardous situation ends or is corrected.

AUTHORITIES

Impetus for the hazardous tree program derives from aspects of liability. The Federal Tort Claims Act-1 46 (28 USC 2671-80 and 1346 (b)) provides the basis for the Service to be held liable for failure or negligence with respect to visitor protection. Most interpretations of tort law make the landowner responsible for taking reasonable care to avert harm to visitors. Reasonable care may take the form of action and/or warnings. The government as a landowner is required to have superior knowledge of dangers which would not be obvious to the invitee if such dangers are discoverable in the exercise of due care. For example, in Middaugh v. U.S. (1968), where a camper was killed when a decayed tree fell on his campsite in Yellowstone, it was determined that NPS had a duty to inspect the campsite for obvious safety hazards. Since the camper was in a designated area he had the right to expect to be reasonably safe.

The clear agency policy espousing a duty to protect visitors means many courts may choose to use it as the criterion for determining degree of responsible action rather than turning to local or common law or even precedents. Further emphasis on federal responsibility rises as sharper distinctions are made between discretionary management decisions for which there is little liability and administrative function, which, if improperly performed, may result in liability. Other liability variables such as assumed risk by the visitor and leaving wild areas unaltered by management actions are also decreasingly available retreats from agency responsibility. In many cases, the more an agency does to protect the visiting public or enhance their experience, the more vulnerable the agency may become to tort claims. Hence, the more areas are developed and become places where the visiting public is invited, the more likely is the occurrence of hazardous tree problems.

PROGRAM GUIDANCE

The hazardous tree program is implemented through a hazardous tree management plan (HTMP). The HTMP should be utilized as an action plan and a component of the park's resource management plan. Each park containing large vascular plants (usually trees) should be covered by this plan. The following guidance may be used in developing a park plan. Each plan must be tailored to a park's particular requirements according to vegetation type(s), type of visitor use areas, frequency of visitation, and other factors.

I. Park Responsibilities

A. Inspection

Periodically, any trees which stand within falling distance of public use areas and which might pose a hazard to the public or significant property should be systematically inspected for flaws. The form and frequency of routine inspection or surveillance will depend on the type of visitor use areas (which will be defined later). The constraints of manpower available to a park may not permit periodic inspection of all pertinent areas. Nevertheless, a documented effort toward

achieving the goal will undoubtedly be helpful in avoiding negligence in the event of an accident in an area which has not been inspected. Frequency of inspection as called for in the HTMP becomes a local issue keyed to the nature of the park and visitor use. The plan should indicate with accompanying rationales the periodicity of inspections for various visitor use areas. For many areas a frequency of once a year would be the norm. In addition, particular events such as wind storms or fires (for example, the Yellowstone fires of 1988) may call for special inspections.

B. Public Notification and Warning

Where extensive risk may exist from falling trees, but the trees themselves are not classified as hazardous, a means for public notification and warning of potential hazards is required. This situation is analogous to a falling rock zone in that although there are no detectable flaws in the trees, any one of them could be blown on to a passing vehicle during a wind event. The concern may result from the steep slope, slow moving traffic pattern, exposure to unpredictable wind patterns, shallow soils, or other factors. Such areas might even be closed in advance if predictions of sufficiently hazardous weather conditions exist. The warning is given in terms of a dangerous area, not hazardous trees. Another example is the risk to campers from falling trees or limbs during an ice or snow storm. This situation normally can be addressed in the permit process where the camper or visitor is notified that he may be asked to vacate the campsite or park in the event of adverse weather conditions.

C. Tree Care

Any tree denoted as hazardous should be promptly cared for, using the best arboricultural techniques, to eliminate the hazardous status of the tree. If it cannot be made safe, or if the effort to make it safe would be too costly in terms of manpower or dollars, then the tree may be removed. A very important point is that once a tree has been categorized as being hazardous, any damage that occurs thereafter from that tree will almost surely result in liability. It is, therefore, critical that inspection programs be closely linked with capability for remedial action; otherwise the park will expose itself to financial risk.

D. Remedial Action

Depending on the location of the tree and its integrity, the park may consider leaving the main trunk of the tree for wildlife habitat in areas where wildlife is considered an important element and where ample den or food trees do not exist. This means that a dead tree need not necessarily remain a hazardous tree and that it is possible to convert a hazardous tree into a positive environmental element. Part of the decision-making process must include the extra manpower (time commitment) in topping a tree as opposed to dropping it. Where a structural target exists, removal of the target is another option if the value of the tree exceeds that of the target.

E. Personnel

Each park should have at least one person designated for hazardous tree inspections. This responsibility should be explicit in the individual's performance standards. Other park personnel should also be on the lookout for hazardous trees in performing their own duties.

F. Exceptions

The hazardous tree management plan should **not** address situations where there is risk of a vehicle driving into a healthy tree along a roadway; this should be addressed in another part of the safety program.

II. Types of Inspections

The following types of inspections should be conducted by a team of at least two persons with the form of inspection selected according to the nature (management zone) of the site. Trees requiring follow-up action should be marked and documented.

Individual trees. Each tree in the specified area will receive a 360-degree visual inspection for flaws. This means close visual inspection, including tests with various tools as warranted.

Walk through. Walk through the area visually scanning for potential flaws. This includes inspection of individual trees suspected of being hazardous, as above.

Drive-by or windshield survey. This type of survey involves deliberate visual scans at slow vehicle speed followed by inspections of all trees noted or suspected of possessing hazardous characteristics. Despite the practicality of this form of inspection, particularly where long stretches of roadway are involved, the obvious limitations of the effectiveness of this method may not allow it to be very persuasive in a court of law. Only a thorough documentation of findings, if it can establish a professional level of work, will lend any credence to this method.

Use of binoculars, knives, wood chisels, hammers, coring devices, and other tools should be encouraged to enhance the quality of the inspection process. Park areas that are closed for a season(s) would best be inspected just prior to reopening. Areas should remain closed or be closed until hazardous tree conditions are eliminated.

III. Documentation

Whatever type of inspection is chosen, it is imperative that written documentation of the inspection be kept. A "hazardous tree log" should include the persons making the inspection, date(s) of inspection, the area covered, management zone, noted or suspected hazardous trees (include

location, size, and species of tree), ratings, notes on inspections of individually checked trees including description of the flaws, recommendations, and documentation of follow-up actions. The record of inspected trees from year to year can be useful to document whether a tree is declining, stable, or regaining vigor. Photographs may also be used to supplement the record.

A hazardous tree record form used by the State of Washington Department of Natural Resources (see Exhibit 1) is provided as a guide for use by the parks in deriving a form to meet their needs. (Also see Example of a Hazard Rating System, below).

IV. Inspection Types Keyed to Use Areas or Management Zones

It is suggested that the following management zone types be inspected according to the given procedures; however, the park should use its best judgment, particularly if there is good cause for more thorough inspections.

A. Wilderness or Undeveloped Areas

Ordinarily no inspections are called for in these areas. Visitors are expected to know that they are responsible for their safety in such areas. Public education and/or warning procedures should be considered. However, where wilderness or backcountry campsites are designated and assigned by the NPS, the area should be inspected and hazards removed at such sites.

B. Trails or Informal Activity Areas (Walk Through)

Long horse trails or hiking trails might involve some form of inspection. Inspections of such trail systems often will not be a high park priority because of the extremely low risk to visitors and because of the extensive manpower requirement.

C. Developed Zones

Campgrounds, picnic areas, visitor centers, parking lots, interpretive areas, and similar areas should be given individual inspection, possibly in combination with walk throughs. All trees within falling distance of designated use space should be individually checked. In buffer, transition areas, or perimeter zones, inspections may be accomplished by walk-through procedures.

D. Transportation Corridors

Deliberate visual inspections of transportation corridors should include all trees that could affect the roadway. Areas that may be screened or otherwise difficult to view from the road should be given a walk-through inspection. Drive-by inspections may not catch all flaws in the trees along roadways. However, it is generally recognized that it may not be realistically possible to walk by all trees along miles of roadways, and under these conditions a documented drive-by inspection

should be considered satisfactory. Usually the quality of documentation of suspected hazardous trees will reflect the adequacy of the drive-by inspections. In some areas the park may even want to adopt a policy for establishing a "window" of clearance along the roadway to minimize the risk of the heavy portion of a tree falling onto the roadway. Such a window should reflect the size of the trees along the road in the park. Often a window thirty feet wide and twenty feet tall is sufficient. This clearance also promotes lines of sight but may be at the expense of natural areas. Areas along roadways where traffic may be predictably and repetitively slowed, such as near controlled intersections, should be handled by walk-through inspections.

E. Landscaped and/or Cultural Zones

Trees within areas of landscaped zones where visitors are specifically invited to go should be individually inspected. Trees close to parking lots and parking areas along roadways should be individually inspected. More informal areas where visitors may simply feel free to wander should receive walk-through inspections. In the specific case where a tree is designated as an Historic Tree or part of an historic scene, extraordinary effort will be directed toward comprehensive arboreal treatment to sustain the tree while protecting the public from flaws. Much more effort and care will be used on such trees than would be used in other situations owing to the value and significance of the particular resource.

F. Park Boundary Areas

Inspection of trees along park boundaries for threats and damage to adjoining properties or people may be performed in conjunction with other boundary activities. Even though it may be almost logistically impossible for large parks to systematically inspect their boundaries, the park should periodically make a deliberate effort to check for hazardous trees primarily near activity areas such as homes, yards, or roadways.

Parks should be knowledgeable of state and county rights-of-way as the basis for determining whether a park tree could fall on a nonpark roadway. Whenever the park is notified of a presumed hazardous tree by a citizen, a prompt inspection should be made and corrective action taken, as warranted and documented.

V. Types of Hazardous Tree Conditions

It is not the intent of this section to technically define or characterize all of the various sorts of hazardous tree conditions. Such information can be obtained through training, experience, and references. However, the following list includes many of the most common types of hazardous tree conditions:

- Decay
- Cavities
- Dead limbs (overhangs)
- Splits and shakes
- Weak crotches
- Heavy horizontal limbs
- Basal or crown rot; root decay
- Termite and carpenter ant infestations
- Wind and vehicle damage
- Construction damage
- Leaning trees, heaving
- Soil slippage areas
- Tree declines: insect pest and disease situations
- Heavily-used areas with compacted soil and injured roots

VI. Evaluation of Hazardous Trees

The following factors should be considered when trying to evaluate the risk of a potentially hazardous tree. The park should adopt a rating system of its choosing as part of the plan. A decision would normally be either to let the tree remain, monitor the tree, care for the tree, or remove it.

Probability of failure. Estimate the likelihood that under critical weather situations or through predictable decline that tree (branch) will fall during the year.

Probability of target impact. Analyze the potential that a falling tree or limbs will strike a given visitor use area. Estimate the likelihood (seasonal or otherwise) that a given area will be occupied. This estimate may also be made in terms of percentage of the time the area is occupied (e.g., campsite reservation lists).

Estimate of target. Estimate the value of the target when property is involved, or the numbers of visitors that might be injured or killed.

A. Estimate of Total Risk

Where meaningful, derive a total risk involving the combination of the three factors above in terms of dollars or chance of personal injury or loss of life. Even though the above factors can to some extent be quantified, more so in some cases than others, most emphasis should be placed on using verbal justifications based on these categories. A numerical risk should certainly be obtained whenever meaningful. Every tree represents some degree of hazard during a given period of time; the objective of park personnel is to take appropriate action as justified in terms of noted hazardous trees.

B. Example of a Hazard Rating System

To assist parks with the development of a hazard rating system as part of the HTMP, the following widely accepted system is outlined as a model. A defective tree is given a rating according to:

(1) the risk of imminent failure of the tree, (2) the likelihood that failure of all or part of the tree will affect a person or property with significant value (historic or monetary value). Normally, rating factor (1), above, is keyed to a range of 1 to 4, with 4 being the greatest risk of failure. Such a tree would be categorized as not only being an imminent risk but having a lean that exacerbates the risk even more. A rating of zero would mean no flaw was detected, and hence there is no known risk. Rating category (2) has been valued on a scale of 1 to 3, with the 3 rating placing the target in the direct path of the tree and likely incurring extensive damage in the event of failure. A rating of zero would mean the tree is in a wild area away from any facilities or designated camping areas and therefore is not construed to impose any risk to a target such as a person or structure.

The sum of these ratings, which may be as high as 7, defines the level of hazardousness for the tree. Using this rating system, the following recommended corrective action chart has been derived.

Rating	Hazardous Condition	Recommended Action
0	No discernible flaw and no construed risk	No immediate action needed
1-2	Minor	Identify and continue to monitor annually
2-3	Low	Monitor at least annually but do not remove
3-5	Moderate	Treat the defect or protect the target
5-7	High	Top or remove the tree or defective limb(s) or move the target

Clearly such a system remains judgmental (hence the overlap of numbers 1-2, 2-3, etc.) and may only work as well as the competence of the inspectors. Other rating systems might work better for a given park. Also refer to Exhibit 1, which uses a similar rating scheme described under item 15 in the Exhibit.

In landscape or restoration areas, an important way to avoid hazardous tree conditions is to ensure that new and replacement plantings utilize trees that will perform well on the site. The site itself may need modification to improve the opportunity for successful tree growth.

ROLES AND RESPONSIBILITIES

I. Park

It is the responsibility of each **superintendent**, as appropriate, to develop and implement a hazardous tree management plan as an action plan. The superintendent must designate at least one staff person (or him- or herself) with the responsibility to perform or delegate (may even be contracted) the necessary inspections. The superintendent is also responsible for training staff for hazardous tree management. He/she also must assure the adequacy of fulfillment of the plan and address the needs for changes or updating. Normally, the superintendent or his/her designee, with advice from the regional solicitor, will represent the park's interests, if necessary, in court. It is likely that most inspections will be performed by staff in the resource management or maintenance units of the park. Personnel must be thoroughly trained so as to be adequately prepared to perform the necessary inspections. Every person in this chain of responsibility should have one or more elements in his/her performance standards fully describing the duties and expectations of the position.

II. Region

Regional Directors should ensure that each park is covered by an adequate hazardous tree management plan as warranted.

III. Washington Office

The **Associate Director, Operations**, is responsible for providing NPS policy on hazardous tree management and implementation of the hazardous tree program.

NOXIOUS PLANTS

In most cases the risk to the visitor from irritating and toxic plants will come from plants in their natural environment. Unlike a hazardous tree that contains a flaw that can to some degree be remedied by treatment, there is no flaw to be corrected with the irritating or noxious plants. Therefore the primary NPS responsibility lies in (1) documenting the presence of any potentially irritating and toxic plants, (2) warning the public through literature and signing of noxious plants, and (3) removal or horticultural management in developed or landscape areas if warranted. In any case, the park should assemble information covering any noxious plants and have a system whereby any affected persons could be treated in the park, at a local hospital, or by a doctor. Perhaps the most prevalent situation from irritating plants comes from members of the genus Rhus, including

poison ivy and poison oak. These native plants thrive in forest edge situations, which happen to be areas prone to frequent visitor contact such as trails, campsites, and picnic areas.

These common situations are best handled by having trained park staff; providing visitors with warning, descriptions, and treatment options through interpretive programs and other means; and by reducing as far as practicable the presence of the plants in the most prominent visitor contact areas.

The presence of such things as mushrooms that are toxic to people when ingested should be dealt with through a system of warnings, public notification, descriptions, and a knowledgeable park staff that is aware of any antidotal treatment or can provide an affected visitor immediate treatment. Park staff should be trained to recognize symptoms from toxins or irritants of indigenous mushrooms and other plants. It should not be the responsibility of the parks to provide medical treatment other than first aid.

DISEASE VECTORS

This section deals with arthropods that transmit zoonotic diseases in the U.S. The most important diseases transmitted by each group of arthropods are listed, and surveillance and management procedures for each are described. For details on diseases and disease vectors, see References, below. Management of disease vectors generally requires assistance from government or university experts, especially when a disease threat is imminent.

Surveillance and management procedures should be coordinated through an integrated pest management (IPM) program that is incorporated into the park's resource management plan. One approach is to prepare a comprehensive list, in consultation with local experts, of all potential vector-borne diseases in the park, establish a surveillance program for those that pose the most serious health threats (perhaps in coordination with county or state vector control authorities), and plan IPM contingency programs for each potential disease, should it appear. The programs can then be reviewed by regional and Washington Office NPS personnel and by the public, thus producing a high-quality management plan and fostering a spirit of cooperation between the NPS and local groups.

DEFINITIONS

A **vector** is an arthropod (or other animal) that can transmit organisms, **pathogens**, that cause disease in a vertebrate **host**. Pathogens can be maintained for long periods of time in a population of hosts called a **reservoir**. A disease that is naturally and continuously present in an area (e.g., in reservoir populations) is said to be **endemic** to that area.

POLICY AND PROGRAM OBJECTIVES

NPS Management Policies allows control of animals, which includes disease vectors, in all management zones "when they present a direct threat to visitor safety and health,...." (4:6) Exotic species already present in parks will be controlled when they pose "a public health hazard as determined by the Centers for Disease Control or a hazard to public safety." (4:12) Native pests may be controlled under the same conditions. (4:13) Decisions to initiate control must be based on research, and must comply with established planning procedures, including provisions for public review and comment. (4:6) In the case of persistent problems, a decision should be made whether curtailing visitor use of an area might be more desirable than controlling vectors. (4:6) Finally, the need for and results of any control effort must be evaluated and documented by research studies and in the resource management plan. (4:6) The above refers to control programs. A response to a specific, unanticipated emergency should be based on the best information available.

The presence of a vector species does not necessarily mean that human health is threatened. The vector may merely be a nuisance pest if it is not infected with pathogens. When control is deemed necessary, IPM procedures must be followed. (See Chapter 2, Integrated Pest Management.)

AUTHORITIES

Any pesticide applications will be subject to regulations under the Federal Insecticide, Fungicide and Rodenticide Act, Department of the Interior policies and procedures (DM 517), EPA regulations at 40 CFR, and Occupational Safety and Health Administration (OSHA) regulations.

RELATIONSHIP TO OTHER GUIDANCE

A public health guideline, NPS-83, is in preparation. In this Guideline, see Chapter 2, Integrated Pest Management.

PROGRAM GUIDANCE

I. Ticks and Tick-Borne Diseases

Ticks are arachnids (related to mites, spiders, scorpions, etc.) and thus have eight legs as adults. There are two families of ticks, the hard ticks (Ixodidae) and soft ticks (Argasidae). Both can transmit diseases, but in North America the hard ticks are more important as vectors of human disease.

A. Lyme Disease

The most common tick-borne disease in the U.S. is Lyme disease. At the time of this writing (1990), Lyme disease is concentrated in the northeastern states (Connecticut, Massachusetts, New Jersey, New York, Rhode Island) and north-central states (Minnesota, Wisconsin), but is present elsewhere, including California, Oregon, Texas, and the mid-Atlantic and southeastern states. Lyme disease appears to be increasing in geographical range.

Lyme disease is caused by a corkscrew-shaped bacterium (spirochete), Borrelia burgdorferi. The most important vector in North America is the northern deer tick, Ixodes dammini (certain other tick species can sometimes transmit the disease).

B. Rocky Mountain Spotted Fever

Rocky Mountain Spotted Fever (RMSF) is presently most common in the eastern states and some central states, with relatively few cases from the Rocky Mountain region. In 1986, the states with most cases were the Carolinas and Oklahoma. RMSF is also endemic in some parts of Canada, Mexico, and South America.

The pathogen that causes RMSF is Rickettsia rickettsii. The rickettsia are a group of very small bacteria. The major vectors of RMSF are the American dog tick, Dermacentor variabilis, in the East, and the Rocky Mountain wood tick, D. andersoni, in the West. (Certain other tick species sometimes transmit RMSF).

C. Other Tick-Borne Diseases

Several other less-common tick-borne diseases occur in spotty infestations in the continental United States. The most likely to be encountered are **Colorado tick fever** (Rocky Mountain states, the Black Hills of South Dakota, and western Canada); **tick-borne relapsing fever** (western U.S. and on other continents); **tularemia**, or **rabbit fever** (distributed widely in North America and on other continents); **babesiosis** (coastal Massachusetts, Rhode Island, and Long Island, N.Y., especially on islands off the coast); and **ehrlichiosis** (southeastern and south-central states). Identification of these and other less common tick-borne diseases will generally require the expertise of local physicians and scientists, or of experts from the CDC.

II. Surveillance and Management of Tick-Borne Diseases

A. Surveillance

Adult Ixodes dammini, Dermacentor andersoni, D. variabilis, and Amblyomma americanum attach readily to humans and domestic pets and are often encountered by NPS staff and visitors in infested areas. Specimens can be placed in vials directly in 70% ethanol, if available, or in 70% isopropyl

alcohol (rubbing alcohol) for preservation. Individuals can be kept alive for analysis to determine if they harbor pathogens by placing them in a vial with a secure cap with a piece of slightly-moist paper towel, and keeping the vial in a refrigerator until it can be picked up for analysis. Ticks will generally survive for a few months under these conditions. **Be extremely careful when handling live ticks.** They can escape easily, are notorious hitchhikers, and should not be moved from infested to uninfested areas.

Each vial should contain a date-locality label with the collection site (city, county, state), collection date (use the format: day, month, year; e.g., 15 July 1988), and name of collector. Information on the collection method and the species of host, if collected from a host, should also be included. Labels should be written with waterproof black ink, allowed to dry, and placed in each vial with the specimen(s). Temporary labels should be written in pencil; moisture in the vial will cause the ink from ballpoint pens to run and the label will soon be unreadable.

Haphazard collection of ticks can alert resource managers to potential problems, but is not a dependable monitoring technique. Furthermore, many tick species (including the immature stages of I. dammini, D. andersoni, and D. variabilis) attach mostly to small mammals and are not effectively sampled from large-mammal hosts. Other commonly-used sampling methods include flagging (a piece of light-colored cloth, usually flannel or corduroy, is attached to a wood base and dragged through tick habitat), dry ice (which attracts ticks), trapping freeliving ticks, and sampling from hosts that are captured in the field. Rigorous surveillance methods should be applied by experts, especially in areas that are endemic for tick-borne diseases and where the potential exists for exposure to infected ticks. Contact the Environmental Sanitation office in the NPS Washington Office for more information.

B. Management

Management of tick-borne diseases is best accomplished with a many-faceted approach, which should emphasize public education. NPS staff should be knowledgeable about endemic tick-borne illnesses, and information should be made available to park visitors in visual displays, brochures (the brochure Ticks and Lyme Disease in the National Parks is available from the Environmental Health office), and interpretive presentations. These presentations should stress the importance of early diagnosis and treatment. Tick-infested areas should be posted with signs warning of possible tick bite and disease transmission. In addition, persons engaged in high-risk activities should be informed of the potential risk and of precautions that can be taken.

The types of activities that involve high risk of tick bite vary somewhat from place to place. Resource managers should consult local experts for specific recommendations. However, some generalizations are possible. At least some ticks can be found in nearly any habitat; the following are habitats with especially high concentrations of ticks.

1. Adult ticks of many species are common in high shrubby or grassy vegetation, especially in ecotonal areas (e.g., near the edges of woods), but also in fields and in the woods proper. Several species (including D. variabilis and I. dammini) are concentrated on paths and animal trails. Adult A. americanum, D. andersoni, and D. variabilis seek hosts from spring through midsummer. Adult I. dammini are active in the spring and fall. At these times of year activities such as landscaping, trail and brush clearing, patrolling natural areas, hunting, following trails to duck blinds, or simply hiking in infested areas can result in increased risk of encounter with ticks.

2. Immature northern deer ticks, I. dammini, seek hosts near the ground in leaf litter in the woods and in low vegetation. During the spring and summer, the following activities can result in increased risk of exposure to immature deer ticks: picnicking or lying on leaf litter, gathering leaves to make bedding, playing in piles of leaves, and crawling through ground-level vegetation and leaf litter to observe animals and plants.

When in tick habitat, people can take several precautions to minimize the likelihood of being bitten by a tick:

1. Wear light-colored clothing. Dark ticks are most easily spotted on a light background.

2. Tuck your pants into your socks and your shirt into your pants. Ticks generally start low down and crawl upward. This precaution will keep them on the outside of your clothing.

3. Inspect yourself frequently for ticks.

4. Use repellents, applied according to label instructions. It is most important to treat shoes, socks, and pants.

5. When you get in from the field, inspect your entire body carefully, including your head and back. Have a companion inspect areas you cannot see, use a mirror, or feel for ticks with your fingers.

Remove ticks as soon as possible. Use fine tweezers to grasp the tick as close to the mouthparts as possible, then slowly and carefully pull it straight out. If the tick breaks off in your skin, get medical attention to remove the fragments. Avoid handling ticks with bare hands (if you must handle ticks, wash your hands afterwards). If you get any symptoms of tick-borne diseases in the following months, such as a rash or flu-like symptoms, tell the physician that you have been bitten by a tick.

C. Integrated Pest Management of Tick Populations

Tick populations are notoriously difficult to manage. Expert assistance is required to establish a tick management program. Contact the regional public health officer or the regional or Servicewide IPM coordinators for information and referrals. The most commonly used tick management techniques are discussed briefly below.

1. Habitat Modification

Commonly-used paths should be kept wide, with the vegetation short. This will lower, but not eradicate, tick populations. The vegetation at the edges of the paths can harbor ticks and should be avoided. Mowing and/or burning over broad areas can lower tick populations temporarily, but must be repeated when the ticks return.

2. Managing Host Populations

Thinning populations or fencing-out hosts can sometimes lower tick populations. However, for some species, thinning of host numbers is not effective (in some cases complete eradication of the host is required). Furthermore, removal of hosts of one tick species can sometimes increase populations of other tick species. Of course, manipulating vertebrate populations has its own ecological effects.

3. Pesticides

It is difficult to control ticks over broad areas using pesticides. Pesticides are most effective for temporary control in a limited area (for example, if a small area must be cleared of ticks for some special function, meeting, conference, etc.). Recently, pesticides have been applied to hosts via bait stations or host nesting material. This approach targets the chemical toward favored hosts, and so can be relatively benign ecologically compared with broadcast spraying. The techniques are promising, but they have thus far been tested on only a limited basis.

III. Mosquitoes and Mosquito-Borne Diseases

Mosquitoes are insects in the family Culicidae. They are characterized by their piercing-sucking mouthparts and by scales on the wing veins. Female mosquitoes feed on the blood of vertebrates to obtain protein for egg development. Males do not bite. Both males and females feed on nectar and other liquids. Immature mosquitoes are aquatic, mostly detritus-feeders.

On a worldwide basis, mosquitoes transmit a variety of diseases caused by diverse pathogens that can have major impacts on human populations. The most common mosquito-borne diseases on this continent, at present, are the **viral encephalitides.**

California Group Encephalitis includes encephalitis caused by the **La Crosse** (LAC) virus, which is most common in the northern midwestern states and is transmitted by Aedes triseriatus. Other types are Jamestown Canyon (JC); Eastern Equine Encephalitis, with human cases primarily in the eastern U.S.; St. Louis Encephalitis; and Western Equine Encephalitis, which occurs mostly in the western and central U.S.

IV. Surveillance and Management of Mosquito-borne Diseases

Surveillance of mosquito-borne diseases can involve monitoring of vector species and/or monitoring of the pathogen in vector individuals, sentinel animals, wild or domestic animals, and/or humans, depending on the purpose of the surveillance program.

A. Mosquito Monitoring

Mosquitoes can be sampled in either the immature (egg, larval, pupal) or adult stages. Immatures live in water, and expertise is required to recognize the habitats of the species of interest. Sampling of immatures cannot be used for surveillance of diseases that occur only in adult mosquitoes. On the other hand, if it is desired to determine whether a given species resides in a park, then sampling of adults is not sufficient. Because adults can fly into park areas from outside sources, immatures should also be sampled. Sampling of immatures also allows prediction of adult emergences. The most commonly used sampling devices for immature mosquitoes are 1) the pint dipper, a white tub-shaped cup on the end of a stick, which can be dipped into water to capture immatures; and 2) a large pipet with a broad mouth and large bulb for suctioning immatures from the water or transferring them from a dipper to a vial.

Adult mosquitoes can be sampled with aerial nets, a variety of traps, with vials during landing or biting counts, etc. Again, the sampling method should be tailored to the park's objective. For example, to sample pathogens from blood-meal-seeking females, then carbon dioxide-baited traps, traps baited with host animals, or collecting individuals that land on the investigators can be used. In contrast, to sample blooded females, resting boxes (black or dark red boxes with one side open) are effective for many species. Each sampling method is biased, and each species is better sampled by some methods than by others (e.g., some day-flying species rarely come to light traps, but are effectively sampled with ovitraps). Again, knowledge of the target species is required to set up an effective monitoring program. Contact the regional public health officer or the regional or Servicewide IPM coordinators for further information and referrals. Some useful references are listed at the end of this section.

Pathogens can be sampled from vectors, wild or domestic hosts, or from sentinel animals placed in the field on tethers or in cages or pens for this purpose. Exact procedures should be obtained from the laboratory that will be testing the samples for pathogens or for antibodies to pathogens.

Such testing can be arranged through the regional public health officer if arbovirus (arthropod-borne virus) activity is suspected in the area.

B. Mosquito Management

A great variety of options are available for mosquito management. However, there is a central problem in vector management that is especially acute for mosquitoes. That is, vector species are often present with no pathogens. Mosquitoes can be present in an area for several years with no disease transmission, and then infected individuals can "suddenly" appear and transmit disease agents to humans with no obvious warning. From the point of view of NPS management policies, it is important to know whether a vector species will actually serve as a disease vector, or whether it will merely be a nuisance. The decision as to whether a species should be controlled depends, in part, on its status as a disease vector, which can change through time and is often unpredictable.

Another problem arises from the fact that mosquitoes are more effectively managed in the larval than adult stages. Larvae are sedentary, live in identifiable habitats, and are often highly concentrated. Furthermore, several nonchemical options are available for larval control. In contrast, adults are often highly mobile, tend to spread out, and are difficult to control without spraying insecticides over large areas. Furthermore, when adults are on the wing, any disease problem is often already manifest (i.e., people are getting sick). Since, as discussed above, the likelihood of disease transmission often cannot be assessed during the larval stage, it is often difficult to determine if and when one should implement management options. Again, this emphasizes the value of having an IPM plan in place that includes surveillance along with specific guidelines as to what steps should be taken under which circumstances.

With these problems in mind, a summary of currently available mosquito management procedures is given below.

1. Larval Management

Since larvae live in water, a major mosquito management tool is manipulation of wet areas. However, manipulations of natural areas are generally unacceptable in parks. The precise form of the manipulation depends on the target species. Sanitation is generally acceptable, and removal of discarded paper and plastic cups and old tires, unplugging of clogged rain gutters, and filling in or removal of hollows that collect rainwater will lower populations of some species. However, a common approach to mosquito control is modification of natural wetlands to decrease the abundance of favorable breeding sites (e.g., modifying marshes or swampy areas to form ponds or impoundments with well-defined borders, ditching to drain water off the marsh after flood tides, or modifying the marsh so that favorable muddy oviposition sites are permanently covered by water). Open marsh water management uses a combination of approaches to produce a natural-looking marsh with minimal mosquito breeding area. These approaches are generally prohibited in parks, especially in natural zones. They involve large-scale environmental manipulations that can have

important effects on the local plant and animal species, and on the hydrological characteristics of the site. Also, manipulations that effectively manage one species can sometimes create conditions favorable for population increase of other species. Guidance about the acceptability of specific techniques under the conditions in individual parks is available from resource management and research personnel in the regional offices and the Washington Office.

Biological control of mosquito larvae often involves introduction of mosquito larvivorous fishes, such as the mosquito fish Gambusia affinis and the guppy Poecilia reticulata. This is generally prohibited in park areas where these species are not naturally present. The effectiveness of these species varies considerably in different trials, partly because they survive better in some habitats than others. Furthermore, they can have major effects on resident fish populations, often replacing local species by competition and egg predation. Again, regional and Washington offices should be consulted if such techniques are considered.

Microbial control agents for mosquito larvae are commercially available in several formulations. Bacillus thuringiensis israelensis (Bti) produces a toxin that, upon ingestion, disrupts the gut and kills mosquito larvae. It often, but not always, provides effective control. Treatment failures often result if Bti is applied too late (after the early instars--stages between successive moults) or in a formulation that does not penetrate the vegetation and get down into the larval habitat. Compared with most other approaches, Bti is quite selective, affecting only larval mosquitoes and some related flies (e.g., black flies, chironomid midges).

Numerous larvicides are available for mosquito control. These include toxins, oils (which act by disrupting the water surface), and insect growth regulators. Larvicides and microbial agents for mosquito control have been reviewed for the NPS by Joslyn (1987).

2. Adult Management

Biological control agents such as birds, bats, and dragonflies eat large numbers of adult mosquitoes, and can sometimes provide a measure of control. However, they are probably not effective under outbreak conditions because their populations do not respond rapidly enough to the sudden dramatic increases of mosquito numbers during massive emergences (e.g., emergences of salt marsh mosquitoes after a flood tide, or of temporary pool breeders after a period of rain).
Spraying or ultra low volume (ULV) application of adulticides by hand-held sprayer, truck, or aircraft can cause rapid local declines in mosquito numbers. However, if the source of mosquitoes (breeding site) is outside of the treated area, adults often quickly reinfest the area. Adulticides are also reviewed by Joslyn (1987). In general, adulticides are called for when a rapid decline in mosquito numbers is necessary (e.g., when infected adults are found to be transmitting disease agents).

Personal protection against mosquito bites can be provided by the use of repellents applied according to label instructions. Protective clothing impregnated with repellent is available. Note,

however, that some repellents have their own adverse health effects, so repeated and excessive use, especially on bare skin, should be avoided.

Some species tend not to enter houses, while others enter quite readily. Mechanical barriers such as screens can provide protection against these species indoors.

V. Fleas and Flea-Borne Diseases

Fleas are insects of the order Siphonaptera. They are wingless as adults, with a laterally flattened body, and piercing-sucking mouthparts that they use to ingest host blood. The larvae, which are off-white with segmentally arranged bristles and chewing mouthparts, are active in the nests of host animals where they feed on detritus and droplets of blood.

The most important disease transmitted by fleas is **plague**, which is caused by a bacterium, Yersinia pestis, and mainly affects rodents. The disease can be transmitted by fleas to humans who are in close contact with infected animals. Cases still occur each year in the West and Southwest, where it is endemic, especially among ground squirrels and prairie dogs.

Plague can be treated with appropriate antibiotics, if caught early. Vaccination is available, and is especially important for people who regularly have close contact with rodents in areas where the bacterium is present. Repellents can minimize the likelihood of flea bites for humans; flea collars and powders offer some protection for their pets. **Murine typhus** is a natural infection of rats that can be transmitted to humans by fleas. In the U.S., it is most common in Texas.

A. Flea Surveillance and Management

Flea populations can be assessed by sampling from living or freshly-killed hosts. Expert guidance is required to set up a flea sampling program, especially in areas where plague may be present. Contact the regional public health officer for referrals.

The most straightforward means to avoid plague are to avoid contact with rodents and to maintain conditions that prevent increase in exotic rodent populations. Public education is an important aspect of plague management. Park staff and visitors should be aware if plague is potentially present, take appropriate precautions, and seek prompt treatment if infected. Information can be disseminated through displays, brochures, interpretive presentations, and on signs posted in high-risk areas.

Precautions include avoidance of rodent burrows, use of repellents, and vaccination for people who have regular contact with rodents. Flea collars, powders, and/or systemic insecticides help manage fleas on pets. Sanitation measures include removal of debris (beneath old carpets and in cracks and corners) in which flea larvae live. Management of exotic rodent populations can include

removing potential nesting areas, covering all food, ratproofing buildings and waste collection areas, and, if necessary, lowering populations by trapping or use of rodenticides.

If necessary, fleas can be controlled by insecticides applied to rodent burrows, or in baits that are collected by rodents and taken back to their nests. Such measures should only be taken when needed, according to criteria that should be stated in the resource management plan, as outlined earlier.

VI. Other Biting Arthropods

Several other arthropods bite humans, but rarely transmit diseases in North America. Among the insects, bed bugs (order Hemiptera, family Cimicidae) bite people, but are apparently not important disease vectors. Elsewhere, lice can be serious nuisance pests (louse infestation is called **pediculosis**) but rarely transmit diseases in North America. Lice can transmit the rickettsial **trench fever** and **epidemic relapsing fever** (caused by the spirochetes of the genus Borrelia).

The role of biting midges or "no-see-ums" (family Ceratopogonidae) in disease transmission is not well understood, although they have been implicated in transmission of some human and animal pathogens. Horse flies and deer flies (family Tabanidae) can be serious annoyance pests, and can transmit some human and animal diseases (mechanically, in most cases). The stable fly (Stomoxys calcitrans), is another nuisance pest with a poorly understood role in disease transmission. Some species of flies infest living animal and sometimes human tissue (a condition called **myiasis**), most notably screwworm flies (Cochliomyia hominivorax, family Calliphoridae) and bot flies (families Oestridae, Gasterophilidae, and Cuterebridae). At present, human myiasis is relatively rare in North America.

Among the arachnids, several species of mites parasitize humans, sometimes causing dermatitis and allergic reactions. Notable examples are the itch mites (Sarcoptes scabei and relatives), which cause **scabies** in humans and **mange** in animals. Larval mites in the family Trombiculidae, called chiggers, are primarily nuisance pests in North America.

ROLES AND RESPONSIBILITIES

I. Park

The **superintendent** is responsible for ensuring that procedures for dealing with disease vectors are addressed in the resource management plan. Ordinarily, the responsibility for drafting and implementing specific procedures in each park belongs to the **resource manager**.

II. Region

The **regional chief scientist** provides guidance on the scientific tasks of monitoring and is responsible for review and approval of research proposals and programs enacted by parks to address specific disease problems. The **regional public health officer** is responsible for coordination between parks and local and state public health officials, and advises parks closely on communicable disease problems. The **regional public affairs office** works with the regional public health officer to ensure that accurate and effective signs, brochures, and media announcements are prepared.

III. Other

The **Harpers Ferry Center** is responsible for creating Servicewide sign and informational materials. The **Environmental Health office**, in the Washington Office, serves as a liaison between the NPS and the Centers for Disease Control (CDC). The **Servicewide IPM coordinator** provides assistance in integrated pest management. Universities and Cooperative Park Study Units can provide expert assistance on local problems. The resource management and research staffs of NPS regional and Washington offices should also be consulted for technical assistance.

DISEASE OUTBREAKS AND EPIZOOTICS

DEFINITIONS

Epidemic (epizootic) A widespread outbreak of a disease in wildlife, which appears occasionally or periodically and which clearly affects a number of individuals in excess of normal expectation.

Endemic (enzootic) A disease which is indigenous to or normally present among the population of an area.

The terms epizootic and enzootic are usually used to describe disease processes in animals. They are used interchangeably here with the more widely known terms epidemic and endemic.

PROGRAM OBJECTIVES

Disease in wildlife which is widespread and affects a large number of individuals at the same time (epizootic), or which occurs in localized outbreaks (grouped cases), can be associated with high population densities, crowding, stress, malnourishment, or other natural or artificial causes. In cases involving disease that can be transmitted to humans, emphasis should be placed on preventing human contacts with wildlife or avoiding exposure to the direct environmental routes by which certain diseases can be transmitted, on monitoring and record-keeping, on cooperative involvement with public health officials and authorities, and on public information programs aimed at fully informing park visitors, users, and personnel of the nature and extent of health threats deriving from outbreaks.

AUTHORITIES

Laws regulating the keeping and leashing of domestic pets are established in 36 CFR 2.15(a)(2) and 36 CFR 2.15(e). Regulations for park closure and public use limits are specified in 36 CFR 1.5(a-f), and for public notice in 36 CFR 1.7(a,b).

RELATIONSHIP TO OTHER GUIDANCE

Guidance for dealing with outbreaks deriving from contaminated food and water or other adverse environmental conditions is provided by Staff Directive 76-4 (revised), Procedures for Handling Illness Complaints in NPS Areas. Medical authority, care, and response requirements are established in NPS-51, the Emergency Medical Services guideline. The Compendium of Animal Rabies Control, issued yearly by the National Association of State Public Health Veterinarians (NASPHV), provides general guidance for rabies control. Guidelines for recommending pre- and post-exposure rabies prophylaxis (preventive treatment) are available through state health departments or the Immunization Practices Advisory Committee of the U.S. Public Health Service. A public health guideline, NPS-83, is in preparation. In this Guideline, see Hazardous Animals, above, and Chapter 2, Native Animal Management.

PROGRAM GUIDANCE

I. Rabies

A. Prevention of Rabies in Humans

Rabies prevention in humans is achieved either by eliminating contact between people and animals which are capable of transmitting rabies or by thorough cleansing of bite or wound sites (first aid) followed by immediate examination by a physician and consultation regarding the advisability of post-exposure immunization (prophylaxis). Avoiding or preventing human-wildlife and domestic animal-wildlife contacts will be emphasized as the primary means of rabies prevention in parks. Where wildlife rabies persists, pre-exposure treatment (prophylaxis) is recommended for employees at risk for contact with those species capable of transmission.

B. Prevention of Rabies in Wildlife

Complete prevention of rabies in wildlife species is difficult even in areas where unrestricted population management can be conducted. Population reduction or suppression is not recommended for control of wildlife rabies in parks. Where such measures are deemed critical to the protection of human health and safety, they must be substantiated by scientifically valid resource information, with planning and implementation of control actions conducted in compliance with established planning procedures, including the opportunity for public review and comment.

C. Control of Rabies in Wildlife

Removal of individual animals harassing or posing a direct threat of physical contact with humans in certain areas is permissible. Such areas include, but are not limited to, developed and landscaped zones, picnic groves, campgrounds, buildings and structures, and areas in which daily human use occurs. Individual animals which attack or threaten humans should be dealt with following the guidelines for hazardous animal control (above). In areas where rabies is prevalent, mammals which attack without provocation and bite humans should be humanely killed in such a manner as to leave the head intact. The carcass or head should be submitted to a qualified state or local laboratory for rabies testing after guidance on procedures for preparing and forwarding specimens is obtained from them. If the animal causing the exposure cannot be immediately identified and captured, rabies exposure should be assumed and the individual bitten should seek immediate advice of a physician.

D. Control of Rabies in Animals Housed or Maintained in Parks

The keeping of pets by residents in parks is regulated by 36 CFR 2.15(e). All domestic cats and dogs housed or kept in parks will be vaccinated against rabies by a licensed veterinarian in accordance with state and county regulations. Wild and exotic animals (e.g., ferrets) should not be kept as pets in parks where either terrestrial or bat rabies may occur. The offspring of domestic dogs or cats bred to wild species should be considered wild animals and not housed or kept in parks. Livestock kept in parks should not be vaccinated except under the advice of a veterinarian in areas where wildlife rabies is epizootic.

The keeping of captive wildlife in parks where terrestrial wildlife rabies is present should be discouraged. Where wildlife is maintained in parks for educational and interpretive purposes, precautions will be taken to ensure that animals are housed in such a way that no contact with wild species is possible. Contact with humans should be minimized to that necessary for the care and well-being of captive wildlife species. Unusual changes in behavior, especially sudden aggressiveness and unprovoked attacks on handlers or caretakers, should be treated as suspect and, upon the advice of a veterinarian, animals so responding should be euthanized and tested for rabies.

E. Control of Rabies in Stray and Feral Animals

Stray and feral animal populations should be managed following the guidelines for exotic species control (Chapter 2, Exotic Species Management.) Where rabies is a problem in feral animal populations, parks should establish, in cooperation with state and local health and animal control authorities, special control programs together with public notification and education campaigns. Information on applicable standards and procedures for rabies control in feral animals can be sought in publications such as Guidelines for Dog Rabies Control (1987), published by the World Health Organization.

II. Grouped Cases and Localized Outbreaks

Certain diseases (e.g., giardiasis, histoplasmosis) may be spread to humans from wild animals through environmental routes. Monitoring of illness and recognition of threats from various environmental sources, followed by action to identify source(s) and immediately prevent further exposure, is the primary means of control. Where feasible, environmental modifications, such as cleanups or removal of potential contaminants, should follow.

III. Adjunct Procedures

A. Record Keeping

Possible human exposures to communicable wildlife diseases or grouped cases of illness in humans which appear to be derived from a wildlife source must be recorded and data transmitted through NPS Environmental Health Offices to state or local health officials. Information to be collected includes name, address, phone number, age, sex, date of contact, species initiating contact (if applicable), others involved, and disposition of animal initiating contact (if applicable). All individuals with possible exposure to rabid animals should be immediately referred to medical authorities. The right of privacy of the individual must be respected in all cases of record keeping.

B. Monitoring and Surveillance

In areas where wildlife diseases communicable to humans have been shown to be present, parks should, to the maximum extent possible, monitor the immediate biological and environmental factors that could result in disease transmission. In the case of rabies and other wildlife diseases transmissible through physical contact, this means monitoring for increased nuisance animal problems, human-animal contacts, apparent or suspected changes in numbers or abundance of rabies-prone species, and unusual or noteworthy changes in the behavior of certain species that might be attributable to rabies outbreaks. In the case of environmentally-borne disease (e.g., giardiasis), monitoring may consist of routine source sampling (e.g., possible drinking water supplies) to ensure that risk of transmission is anticipated. Where such monitoring and other records indicate a need for further investigation, parks should plan, through the regional chief scientist, for more complete surveillance and research programs in cooperation with NPS or state and local health departments.

C. Public Information and Notification

Parks must establish public notification, warning, and education procedures for areas where communicable wildlife diseases are prevalent or persist. Information concerning diseases can take the form of media releases, signs, handouts, brochures, or other means as needed. General steps which might be followed could include:

Notification through signs, handouts, or brochures in those places where other general information on the park is available. These should occur on a routine basis as part of the general information and background material parks make available to the public.

Warning of possible exposure as a more immediate and compelling form of notification where confirmed outbreaks of a disease are occurring and a reasonable expectation exists that further cases might follow. Warning implies a more active form of notification, as in special postings, attention-attracting signs, media releases, and special information brochures. Whenever possible, warnings should be posted near the source of a threat (e.g., by giardia-infested waters).

Education of the public and park personnel involves more detailed transmission of information in which steps to prevent disease transmission are given. For example, procedures for sanitizing drinking water for backcountry users in areas where giardia occurs might be made available through brochures or signs.

D. Importation, Transportation, and Relocation of Wild Animals

In areas where terrestrial rabies is enzootic or epizootic, or where certain wildlife diseases that pose potential threats to humans may occur (e.g., brucellosis), the importation, transportation, or relocation of wild animals susceptible to those diseases should be avoided. Where for reason of population management or the restoration of species it is deemed necessary to assume a risk of exposure this should be fully addressed by the preparation of scientifically acceptable resource information which identifies potential risks. (See also, Chapter 2, Native Animal Management.)

E. Non-NPS Sources of Advice and Authority

1. State Health Departments

Local or state health departments should be consulted when actions are taken by parks to deal with wildlife diseases transmissible to humans. Where parks fall within the borders of more than one state or are under special jurisdiction, superintendents may wish to establish contacts with all involved health officials prior to the rise of problem situations to coordinate reporting and action plans. A memorandum of understanding between state or local departments and parks can be used to specify roles and responsibilities in reporting and addressing epizootic or outbreak control situations. The regional public health officer is available to assist with state and local contacts.

2. Centers for Disease Control (CDC)

The Centers for Disease Control, Atlanta, is a unit of the U.S. Public Health Service responsible for collection and interpretation of data and information on diseases. At CDC the World Health Organization (WHO) maintains the Collaborating Center for Reference and Research on Rabies

(CDC, G33, Atlanta, GA 30333; [404] 639-1050; FTS 236-1050), which is the national authority for rabies surveillance, monitoring, record-keeping, and information exchange for scientific advance and development in rabies research.

3. National Wildlife Health Center (NWHC)

The National Wildlife Health Center (6006 Schroeder Road, Madison, WI 53711; [608] 271-4640; FTS 364-5418) is the national clearinghouse for the FWS for wildlife disease problems and issues, and can provide significant guidance and advice in determining the role of wildlife in transmitting disease to humans.

ROLES AND RESPONSIBILITIES

I. Park

The **superintendent** is responsible for ensuring that procedures for dealing with wildlife diseases communicable to humans are addressed in the resource management plan. Ordinarily, the responsibility for drafting and implementing specific procedures in each park belongs to the **resource manager.**

II. Region

The **regional chief scientist** provides guidance on the scientific tasks of monitoring and is responsible for review and approval of research proposals and programs enacted by parks to address specific disease problems. The **regional public health officer** is responsible for coordination between parks and local and state public health officials, and advises parks closely on communicable disease problems. Regional and Washington Office environmental health offices are the primary contacts for parks dealing with wildlife diseases transmissible to humans. Exhibit 2 lists regional environmental health offices and phone numbers. The **regional public affairs office** works with the regional public health officer to ensure that accurate and effective signs, brochures, and media announcements are prepared.

III. Washington Office

The **Harpers Ferry Center** is responsible for creating Servicewide sign and informational materials.

RADON

The Public Health Service (PHS), Centers for Disease Control (CDC), and the Environmental Protection Agency (EPA) are concerned about the potential for increased health risk of developing lung cancer by persons exposed in homes with radon concentrations greater than average background levels. Radon may be responsible for causing 5000 to 20,000 lung cancer deaths in the

United States each year. EPA estimates 5 to 10 million homes nationwide may have a problem that should be remedied. The NPS is conducting a Servicewide Indoor Radon Program initiated to assess and rectify any excess radon levels in NPS buildings. The Washington Office Environmental Health office is coordinating the NPS radon program. That office is preparing a guideline on public health, NPS-83, that will include specific radon information.

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RECREATION SITE HAZARD TREE RECORD - EXHIBIT 1

1. Site Name
2. Inspection Date
3. Personnel

4 Tree No.	5 Species	6 Age	7 Height	8 DBH	9 Location			10 Part of tree affected	11 Defect Description	12 Target Description	13 Influencing Factors	14 Boring Results	15 Hazard Rating	16 Rec'd Act'n	17 Date & Initials
					Ref. Pt.	Azimuth	Distance								

1. **Site name**
2. **Inspection Date**
3. **Personnel**
4. **Tree No.** - Number defective trees in order of examination for quick reference.
5. **Tree Species**
6. **Age**
7. **Height**
8. DBH
9. Location - Determine azimuth and distance from fixed reference point.
10. **Part of tree affected** - branches, bole, butt, roots
11. **Defect Description** - snag, dead top, thinning, pale or red crown, shortened leader, dead or broken branches, dwarf mistletoe, defoliating insects, split crotch, weak fork, frost crack, lightning scar, fruiting bodies (conks), punk knots, wound, canker, bark insects, dead bark, hollow, resin soaked soil around trunk (resinosus), wet looking bark near base, loosened roots, (leaning tree), rotted roots, fungus mycelium on roots, root insect, other downed trees in area, other _____ (note size of defect)
12. **Target description** - picnic site, campsite, restroom, interpretive sign, viewpoint, monument, playground, boat launch, parking lot, building, other _____
13. **Influencing factors** - fire logging, flooding, poor drainage, construction blowdown, lightning, drought, winter drying, snow, ice, freeze, chemical injury, poor rooting base, prevailing wind azimuth, other _____
14. **Boring results** - If tree is drilled to check for amount of sound wood, note here _____
15. Hazard Rating
    (a) Chance of imminent tree failure (Rate tree 1-4)
    1 = low failure probability
    2 = moderate failure probability
    3 = high failure probability
    Add an extra point if tree exhibits other defects in addition to structural problems, i.e., a lean.
    (b) Chance of doing extensive damage to target (Rate 1-3)
    1 = low damage
    2 = moderate damage
    3 = extensive damage
    (c) The sum of (a) and (b) is the hazard rating for the tree. Use this rating in the following table when deciding on corrective action:

Rating	Degree of hazard	Action
2-3	Low	Monitor-do not remove
4-5	Mod.	Monitor tree for another year or remove tree or target
6-7	High	Remove tree or target

16. **Recommended Action** - Remove tree, remove target, prune top, other _____
17. **Date action taken**

REGIONAL PUBLIC HEALTH OFFICES - EXHIBIT 2

AREA	PHONE (FTS)	PHONE (COMMERCIAL)
National Capital, North Atlantic, and Mid-Atlantic Regions	269-7070	(202) 619-7070
Southeast Region	841-4290	(404) 331-4290
Midwest Region	864-3486	(402) 221-3486
Rocky Mountain Region	327-2920	(303) 969-2920
Southwest Region	476-6367	(505) 988-6367
Western Region	556-3172	(415) 556-3172
Pacific Northwest, Alaskan Regions	399-1006	(206) 442-1006
Washington Office	343-7090	(202) 343-7090

CHAPTER THREE: RESOURCE USES

GRAZING
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GRAZING

Grazing and livestock management in the National Park System is a major activity. In 1988, 118 NPS units reported grazing or livestock use of some type. This program includes legislatively authorized rangeland grazing administered directly by NPS or by another agency for the Service, phaseout situations, pasturing to maintain a historic scene, grazing trespass, and use of trail stock. This section provides guidance on all these elements of the program.

DEFINITIONS

Allotment An area of land designated and managed for the grazing of livestock.

Allotment management plan (AMP) A documented program which applies to livestock grazing on public lands, prepared in consultation, cooperation, and coordination with the permittee(s), lessee(s), or other affected interests.

Animal unit (AU) One mature (1,000 lb.) cow or the equivalent based upon an average daily forage allowance of 30 pounds of dry matter per day. Equivalent animal units are one cow and one calf (under 6 months), five sheep, or 0.75 horses (1 horse = 1.5 AU).

Animal Unit Month (AUM) The amount of forage necessary for the sustenance of one cow or its equivalent for a period of one month.

Class of livestock Age and/or sex groups of a kind of livestock.

Consultation, cooperation, and coordination An interactive process for seeking advice, agreement, or interchange of opinions on issues, plans, or management actions from other agencies and affected permittee(s) or lessee(s), landowners involved, any state or tribal government having lands within the area to be covered by an allotment management plan, and other affected interests.

Desired plant community A characterization of vegetation management objectives for a defined area. This concept requires the land manager to set as a goal the desired plant community (species composition and abundance) for each vegetation unit within the park.

Existing plant community The vegetation currently occupying an area. It is usually described in terms of composition and production, but may include cover and/or structure. It is identified through an ecological site inventory.

Grazing permit A document authorizing the use of park land for the purpose of grazing livestock. The NPS uses special use permits or leases for grazing.

Livestock or kind of livestock Species of domestic livestock such as cattle, sheep, horses, burros, reindeers, and goats.

Livestock carrying capacity The maximum stocking rate possible without inducing damage to vegetation or related resources. It may vary from year to year on the same area because of fluctuating forage production.

Pasture A grazing area enclosed and separated from other areas by fences.

Range condition Current developmental stage of the range in relation to the potential or climax stage of which the area is naturally capable, either in terms of species composition or productivity.

Range/pasture development (structural development) An authorized activity or program on or relating to rangelands or pastures which is designed to improve production of forage; change vegetative composition; control patterns of use; provide water; stabilize soil and water conditions; and provide habitat for livestock, wild horses and burros, and wildlife. The term includes, but is not limited to, structures, treatment projects, and use of mechanical means to accomplish the desired results. Also called range improvement by the BLM and the Forest Service.

Range (ecological) site A relatively undisturbed, ecologically distinct area that is compared floristically to grazed areas with similar abiotic features (soil type, microclimate, topography, etc.).

Supplemental feed A feed which supplements the forage available from the public lands and is provided to improve livestock nutrition or rangeland management.

Utilization The percentage of forage consumed by livestock during a specified period and the livestock grazing utilization pattern on the allotment.

POLICY AND PROGRAM OBJECTIVES

The NPS Management Policies states:

> Commercial grazing or stock driveways will be allowed only in those parks where (1) they are specifically authorized by federal law, (2) they were retained as a reserved right arising from NPS land acquisition, or (3) they are necessary to maintain the historic scene. Grazing and stock driveways will be eliminated in all other parks....Grazing will be managed and conducted in accordance with standards and procedures designed to ensure that it does not result in significant damage to park resources. (8:14)
>
> Where grazing or livestock trailing is otherwise allowed but its continuation would conflict with public enjoyment of park resources or would interfere with the functions of the natural ecosystem, the National Park Service will eliminate grazing, whenever possible, through orderly and cooperative procedures with the individuals or organizations concerned. (8:15)

> Commercial grazing or driving of livestock in park wilderness will be allowed only when authorized by Congress. Where these activities are so authorized, they will be managed under conditions outlined in the wilderness management plan to protect wilderness resources and values. (6:9)

The use of trail stock is a traditional type of recreational use in some parks and can be a useful management tool in some situations.

At present there are six types of grazing on NPS lands:

1. **Legislatively authorized rangeland grazing.** This is livestock grazing that is specifically allowed under a park's enabling legislation to continue indefinitely. Grazing is included, for example, in the enabling legislation of Grand Teton NP and Glen Canyon NRA.

2. **Pasturing to maintain a historic scene.** Livestock are maintained in a fenced pasture for the sole purpose of recreating the historic scene.

3. **Pack and saddle stock.** This involves grazing by horses, mules, llamas, or other stock owned by visitors, the NPS, or concessioners. The use may be intermittent, as the animals travel through a park, or seasonal, as NPS or concessioner stock is pastured.

4. **Phaseout grazing.** This is grazing that is being phased out of a park and the grazing allotments are reduced over a period of time because of legislation or as a result of land acquisition. Management will usually be similar to rangeland grazing or pasturing techniques.

5. **Trailing.** This is a situation where a stock trail traverses a park and livestock herds move through the park along the trail. This activity always requires a permit.

6. **Trespass grazing.** This is livestock grazing in a park without proper authority and resulting from a willful or negligent act.

In parks where authorized grazing occurs, it may be managed by the NPS or through an agreement with the Bureau of Land Management or another agency.

AUTHORITIES

The general authorities discussed in Chapter 1 were augmented by the General Authorities Act of 1970, which states that "each area within the national park system shall be administered in accordance with the provisions of any statute made specifically applicable to that area" (16 USC 1c(b)). Specific grazing authority is found in a park's enabling legislation.

RELATIONSHIP TO OTHER GUIDANCE

Other guidance on grazing is found in 36 CFR 2.60, NPS Management Policies (6:2, 9; 8:14,15; and 4:16), NPS-28, the Cultural Resources Management guideline, and NPS-53, the Special Park Uses guideline. If Congressional intent regarding grazing is unclear in a park's enabling legislation, the legislative history of the enabling legislation should be examined.

Guidance may also be found in the Bureau of Land Management grazing regulations 43 CFR 4100 and U.S. Forest Service grazing regulations 36 CFR 222, as well as the interagency agreement on grazing between NPS and BLM. NPS personnel involved with grazing programs should also be knowledgeable of applicable water laws and regulations and the provisions of the National Historic Preservation Act; the Archaeological Resources Protection Act; the Clean Water Act; Executive Order 11990, Protection of Wetlands; the Endangered Species Act; and the National Environmental Policy Act.

In this Guideline, see Chapter 2, Vegetation Management, Freshwater Resources Management, Protection of Aesthetic Values, Fire Management, Integrated Pest Management, Endangered, Threatened, and Rare Species Management, and Exotic Species Management; and Chapter 5, Special Use Permits, Inventory and Monitoring, and Interagency Agreements.

PROGRAM GUIDANCE

The management of grazing activities involves a variety of management techniques and requires an understanding of the pervasive quality of grazing impacts on park resources. In many places the existing environment has been fundamentally changed from that found by the first Europeans in the area by historical grazing practices. There are also opportunities to use grazing as a vegetation manipulation tool to maintain a historic scene.

Grazing systems can also be altered to achieve park vegetation management goals. This may be especially appropriate for phaseout situations. The main challenge for park grazing managers is the need to state, in quantifiable terms, their goals for vegetation and other resource conditions. Without quantifiable resource objectives, monitoring programs cannot be effective.

I. Grazing Management Plans

Grazing management plans should be developed for all parks where grazing occurs, including parks where grazing is managed by other agencies. These plans may be included within general management or resource management plans, or they may be separate action plans. NEPA and cultural resource compliance should be integrated with the planning process from the beginning. Regional review and approval is required.

Grazing management plans should include:

1. an introduction which includes a discussion of key background information and the authority under which grazing is permitted within the park;

2. resource objectives which should be as specific as possible and for which relative degree of accomplishment can be determined;

3. a description of current conditions, including resource condition and existing and past grazing use;

4. a description of actions to be taken to protect riparian areas, wetlands, erodible soils, water quality, threatened or endangered species, and other sensitive resources;

5. a description of proposed grazing activities which includes type and number of livestock, season of use, duration and frequency of grazing, spatial distribution, and any grazing system(s) to be implemented;

6. structural developments required for use by NPS or concession livestock or as authorized by law or for resource protection; and

7. provisions for monitoring and determining whether objectives are being accomplished.

Flexibility in these components is necessary because of the wide variety of park environments and grazing issues. No single format will be suitable for all parks.

II. Resource Objectives

Establishment of resource objectives is the most important task in grazing management planning. These objectives may vary widely among parks, but should be as specific as possible. A principal emphasis should be on resource conditions to be achieved as a result of the grazing management plan. For example, desired plant communities or values of water quality parameters could be specified. General statements such as "minimize resource damage" are of little value. Each important resource component should be incorporated into grazing management objectives. Additionally, objectives are useless without measurable indicators of success or failure. Monitoring programs should be designed which provide timely feedback for use in evaluation of objectives and grazing management practices.

III. Inventory and Monitoring

A. Introduction

A central component of a grazing management plan is an inventory of all natural and cultural resources potentially affected by livestock use activities authorized in the plan. The inventory serves as a baseline against which all grazing-induced changes should be measured and the overall effectiveness of the grazing management plan assessed.

Once established, the baseline inventory should be followed by a monitoring program. Such a program is necessary to periodically re-evaluate the condition of all affected park resources and to make changes in permit stipulations if necessary. Once a resource baseline is established (see below), specific long-range goals should be established for each resource category.

B. Resource Inventory

All resources potentially affected by grazing activities in the park should be inventoried to establish a baseline condition prior to implementation of the grazing management plan. Inventory data needed to establish the present status of the range and to form a basis for a rangeland monitoring program consist of the following:

1. Soil Conservation Service (SCS) Order 3 soil surveys or other appropriate soil inventories for general soils information and for erodible soils and existing erosion sites;

2. map and description of vegetation types and range sites;

3. quantification of existing range conditions, including current condition and utilization;

4. map of affected or potentially affected surface water supplies and wells;

5. water quality data, patterns of natural fluctuation, existing and potential livestock-induced changes;

6. description of existing aesthetic issues (e.g., wallows, manure);

7. condition of cultural resources (archeological, historic, and ethnographic sites, structures, objects, and landscapes); and

8. condition of threatened, endangered, rare, and sensitive species populations and habitat.

Once baseline conditions for each of the above resources have been established through the inventory process, goals for each category should be developed. To evaluate range condition and

trend, the NPS adopts the "desired plant community" concept (DPC). This concept requires that the land manager set as a goal the desired plant community (species composition and abundance) for each vegetation unit within the park. Specific goals for each of the other resource categories should be developed in a similar manner. Resource monitoring determines whether the goals are being achieved. An additional range parameter that can only be established through continued monitoring and is necessary to predict the future health (condition) of the systems being grazed is "range trend." Range trend indicates changes in plant communities and determines whether succession is proceeding toward the desired goal.

C. Methodology

Where inventories have been completed, existing inventory data may be the starting point for the monitoring program. Methods of collecting data necessary to quantify the parameters described above are available from numerous sources. To enhance communication and improve efficiency, the techniques adopted by individual NPS units should, where possible, be compatible with or match the techniques (and the resultant data) used by adjacent land managers (BLM, USFS, FWS, etc.). Where other agencies actually manage NPS grazing activities (e.g., Glen Canyon NRA), compatibility is essential. In parks where geographic information systems (GIS) are being used or are anticipated, data should be prepared in a format ready for digital rendering (contact the Washington Office, GIS Division, for specific details).

Guidelines have been prepared by the SCS and the BLM establishing protocol on how to develop monitoring programs for range and pasture lands (Rangeland Monitoring: Planning for Monitoring, BLM Technical Reference 4400-1). The techniques in this guide are applicable, with some modification, to NPS areas once the NPS goals are clearly delineated. The NPS, therefore, has adopted this BLM reference to guide development of plant monitoring programs in NPS areas.

Information and data regarding soils inventories, existing vegetation communities (vegetation maps), and initial range condition classifications should be compatible with adjoining areas. For example, if the Soil Conservation Service has conducted soil surveys and prepared soil maps for adjoining areas (state, private, or federal), the SCS should be retained, if possible, to obtain such data for the NPS unit. If the SCS is not used, all data obtained as part of the collection process should be obtained in the SCS format. If adjoining areas have not had such a survey, use the data format most likely to be used by adjacent land areas. There are several sources from which to obtain soil survey information: NPS agronomists and soil scientists, land grant universities , U. S. Forest Service agronomists and soil scientists, and professional consultants. (See Chapter 2, Soil Resources Management, for further information.)

Range condition and the desired plant community (DPC) can only be determined through range site analysis. Range sites are relatively undisturbed areas that are compared floristically to grazed areas with similar abiotic features (soil type, micro-climate, etc.). The DPC or vegetational goal for plant communities within NPS areas is usually the range site for that particular community.

The degree to which the existing condition varies from that found on the range site determines the condition or several stage of the community.

Sampling techniques used as part of a range inventory and monitoring program to establish trend and utilization statistics should be generally accepted (in common use) in the field of range management. Actual sampling techniques are summarized by the BLM in various publications (Technical References 4400-3 and 4400-4). It is recommended that these techniques be used with all NPS range monitoring programs. In addition, photo-documentation through permanent photo points is a relatively easy method to establish present conditions and evaluate future changes.

Monitoring livestock use is important to determine if present stocking rates are valid and the resources of the park are being protected adequately.

Standard techniques are available to monitor rangeland (BLM Technical Reference 4400-2). It is recommended that this reference be utilized for this type of use. For pasture lands, a different approach is necessary and should be tailored to specific situations.

Water quality can be monitored with a variety of techniques. However, there are no specific guidelines to follow for range and pasture lands. As with the plant community analysis described above, water quality monitoring techniques should be standardized. The Standard Methods manual and equipment documentation are potential information sources to standardize all collection procedures. Water quality parameters that can indicate livestock influence on park water resources include the following:

1. fecal coliform analysis;

2. conductivity;

3. pH;

4. turbidity; and

5. macroinvertebrate community composition.

See also, Chapter 2, Freshwater Resources Management.

Aesthetic concerns are also important in managing grazing in NPS areas. How a resource looks to the public often is as important as its health. No standard methods have been developed to monitor this parameter. Visitor surveys represent a possible method to measure aesthetic values. See also, Chapter 2, Protection of Aesthetic Values.

Cultural resources include cultural landscapes, prehistoric and historic structures, archeological resources, and ethnographic resources. Each can be negatively affected by livestock use. It is

important that the degree of influence be monitored so that corrective action can be taken if degradation is occurring. Grazing activities should be restricted or eliminated if a determination is made that impacts on cultural resources are occurring. Photographic monitoring is an accepted technique to document long-term changes. Quantitative measurements are also possible.

The following parameters can be measured to determine the impacts of grazing on cultural resources:

1. structure decay by rubbing and trampling, resulting in such problems as wall collapse and/or building material breakage;

2. breakage of artifacts through trampling;

3. rock art or historic monument degradation due to livestock rubbing; and

4. consumption of historically or ethnographically significant vegetation.

The NPS is responsible for protecting wetlands and wetland values. This is particularly difficult in areas that are grazed, because of the attraction of cattle to wet areas. Soils, vegetation, and wildlife in riparian areas, wetlands, and other wet areas are highly susceptible to damage by livestock, and every effort should be made to ensure that they are protected.

Protection and restoration of threatened, endangered, rare, and sensitive plant and animal species and their habitats are of special concern in managing grazing in parks. Inventory and monitoring for these species require sampling programs similar to rangelands in general but often in a more intensive manner. The inventory process should concentrate on determining the location and abundance of each species and the quality of their habitats. Monitoring should be conducted on an annual basis to ascertain the health of each identified population. See also, Chapter 2, Endangered, Threatened, and Rare Species Management and Chapter 5, Inventory and Monitoring.

The FWS has a Habitat Evaluation Program (HEP) which can be used to determine the quality of animal and plant habitats affected by grazing. The FWS has developed hundreds of Habitat Suitability Index Models through HEP, each described in a separate publication by species. Many of the taxa for which Habitat Suitability Index Models have been developed are for aquatic species (mainly fish) and for riparian plants and animals common (or once common) to lands that have been grazed. The model can sometimes be a useful tool in an inventory and monitoring program to determine precisely why a species is in trouble or absent, what critical habitat factors have been most affected by grazing activities, and which habitat rehabilitation steps may be desirable to restore the species.

IV. Grazing Management Practices

Specific guidelines, or prescriptions, are required for management of livestock while in parks. Number and type of livestock, season of use, duration and frequency of grazing, spatial distribution, and desired plant communities should be discussed. Decisions on these variables should not be arbitrary but should be consistent with resource objectives, and be based on established ecological principles. During this stage of planning it is important to obtain technical assistance from sources with expertise in grazing management (e.g., BLM, USFS, SCS, county agents, universities, and NPS sources).

Grazing occurs in parks for a variety of reasons and under a variety of conditions. Therefore, use of grazing is similar to use of fire; it should be managed with a prescription appropriate for the specific application and area. Specific objectives for resource conditions are the most important components of such prescriptions (e.g., desired plant and animal communities).

A number of grazing systems have been developed and some may be appropriate for use in parks. A grazing system is a sequence of livestock grazing by area which is designed to meet management objectives. Most of these systems seek to minimize changes in plant communities resulting from animal forage preferences, and minimize grazing during periods when plants are most vulnerable to damage. For example, many range plants are sensitive to repeated defoliation during their early growth period, usually in spring. Thus, it is a common practice to defer grazing until later in the season, or to rotate grazing so that early use of any one area occurs less frequently.

Grazing systems used in parks should also include best management practices (BMPs) to reduce nonpoint source pollution of water. Under NPS policies, "Direct pollution by livestock under commercial grazing permits will be prevented by eliminating streamside or lakeside corrals and pastures and associated watering sites on natural waters wherever possible." (Management Policies 4:16) Most grazing systems require careful control of livestock, which is usually accomplished by fencing or herding of livestock. Mineral supplements or water sources may also be used to influence livestock distribution.

Because grazing systems should reflect management objectives and environmental conditions, implementation of a system designed for use in a nonpark area may be unsatisfactory. For example, most systems have been developed for multiple-use lands and therefore may place greater emphasis on benefits for animal production than would be appropriate for park areas. Also park ecosystems are frequently unique or significantly different from those for which grazing systems have been developed. Therefore, substantial modification may be required prior to implementation of these systems in a park.

Flexibility is extremely important in managing grazing, and a grazing management plan should provide for it. Even if a grazing system is adopted which prescribes season of use, acceptable utilization levels, and distribution of grazing, year-to-year variations in such factors as plant phenology and precipitation may require modifications in grazing practices. Rigid adherence to

calendar-based schedules or predetermined stocking rates may result in resource damage. Effective communication with permittees and\or lessees is required to maintain management flexibility, because annual variations in grazing practices may have significant impacts on their livestock operations. Leases and permits should be written to allow modifications in response to environmental conditions.

V. Technical Assistance

Technical assistance for a livestock grazing program is available from a variety of sources including those listed below. Sources in geographically or ecologically similar areas should be contacted first to identify the best management practices for a given park.

NPS regional offices have designated coordinators for the region. They should be contacted first to get a list of local sources of information.

The **Washington Office, Division of Ranger Activities** and **Wildlife and Vegetation Division,** may also be able to identify information sources, especially identifying parks with large grazing programs or issues similar to those in a given park.

The **Bureau of Land Management** and **U.S. Forest Service** have large grazing management staffs in each district which may be of assistance. They each have extensive manuals and handbooks providing a wealth of detail on the full spectrum of grazing management activities as well as design specifications for all structural grazing developments.

The **Soil Conservation Service** can provide technical assistance through locally organized conservation districts in each of the 50 states, Guam, Puerto Rico, and the Virgin Islands. The local phone directory should list the local district office.

The **Cooperative Extension System of the Department of Agriculture** is a nationwide network of county agents of the Cooperative Extension Service and university cooperators who can help in adapting and transferring agricultural science and technology. Each county in the United States has an extension agent. The land grant college or university of the state or approved forestry schools participate in the Cooperative State Research Service program.

VI. Developments (Structures) on Rangeland and Pasture

"No facilities or range developments such as fences, corrals, or water developments, other than those authorized by law or approved for NPS use or concession use, will be allowed in parks to increase livestock numbers or to introduce livestock into areas where they cannot otherwise exist. The National Park Service will not expend funds to construct or maintain commercial livestock facilities unless there is a direct benefit to the protection of park resources." (NPS Management Policies 8:15) Construction of developments (structures) used in livestock operations may be

accomplished by park management or by permittees/lessees under plans or permit that have been approved by the superintendent.

On the termination of special use permits, leases, or agreements, "the grazing permittee will be required to remove such facilities." (Management Policies 8:15)

All developments, facilities, structures, or improvements must comply with Section 106 of the National Historic Preservation Act and NEPA compliance procedures.

A. Development Types (Structures)

1. Fences

Fences are structures to confine or control the movement and distribution of livestock. Fences may be continuous and completely enclose a pasture or rangeland or may be short sections to prevent livestock from using certain steep banks, ravines, or wet areas. Short fence sections can be used to change the direction and pattern of use (trails) of livestock and force them to travel at right angles to the control structure (drift fence).

Fences are by far the most frequent structures found in pastures or on rangelands. These structures vary in initial cost and maintenance depending on type and total length of fence constructed. Historic or cultural areas should use types and styles of fences, at least in public view, that were used in the historic area and during the historic period.

Special structures can be installed to allow pedestrians to pass through and over fences but prevent livestock use and escapes. These are called stiles; various modern and historic designs are available.

Cattle guards can be installed on road crossings to allow vehicle access to pastures and rangeland but prevent livestock access or crossing. Cattle guards allow fencing to cross roads and eliminate the need to construct fences along roadsides.

References: (1) Fence Construction Standards - Gettysburg NMP and Eisenhower NHS; (2) Bureau of Land Management Fence Construction and Management Guidelines; (3) various university extension publications.

2. Corrals, Loading Chutes (Portable and Permanent)

Corrals and chutes are used to confine livestock in a small area for handling, processing, examination, vaccination, artificial insemination, first aid, or loading into trucks for shipping elsewhere. These are now available as portable steel structures that can be set up where needed. They can be purchased by the park or owned and used by the permittee. Setting up portable structures to confine, treat, and/or load one or two sick animals is time consuming and costly. Permanent structures allow the frequent handling, loading, and movement of livestock, so it may

B. Techniques on Rangeland

On rangelands, vegetation management techniques are not appropriate when they are intended to increase forage production for livestock only. It may be appropriate, however, to utilize such techniques to help reach the plant community objectives set forth in the grazing management plan.

Use of mechanized equipment is discouraged in natural areas. Use of non-native seed is permitted where "they are the nearest living relatives of extirpated native species, where they are improved varieties of native species that cannot survive current environmental conditions, where they may be used to control established exotic species, or when directed by law or expressed legislative intent." (Management Policies 4:12) (See Chapter 2, Exotic Species Management.) Herbicides should be used only when there are no feasible alternatives and only under an approved IPM plan.

The following general techniques are used to manipulate vegetation in rangeland situations:

1. mechanical (e.g., chaining);
2. chemical (e.g., herbicides);
3. cutting (e.g., hand and motorized tools);
4. prescribed fire; and
5. seeding (e.g., aerial and hand).

VIII. Permits

Permits are one of the main tools available to manage grazing on NPS units. Several types of permits may be used, but all grazing should be managed under some type of permitting system. The only exceptions to this are park livestock used for interpretation or park operations. The stock utilized for these park activities do not require permits but should be addressed in the park's grazing management plan.

The following are some of the types of permits that can be used to manage grazing.

1. **Historic Property Lease** Certain areas of the National Park System contain cultural landscapes and vistas which are of historical and interpretive significance. These fields, row crops, orchards, pastures, and similar features may be assigned to others to plant, maintain, and manage. Where the criteria of Special Directive 82-12, Policy on Historic Property Leases and Exchanges, are met, such assignments may be made through a historic property lease in lieu of a revokable Special Use Permit, Memorandum of Understanding, Cooperative Agreement, or

other license. (For information on this type of lease see NPS-38, the Historic Property Leasing guideline.)

2. **Special Use Permit** A document issued by a superintendent to an individual or organization to allow use of NPS-administered resources. It is used for all special park uses that do not have an approved permitting instrument. One of the major uses of this form is to cover commercial agricultural activities, including some grazing. (For information, see Chapter 5, Special Use Permits, and NPS-53, the Special Park Uses guideline.)

3. **Lease** A document describing contractual relationship by which one party (landlord or lessor) provides to another (tenant or lessee) the use and possession of lands, resources, buildings, or property for a specified period of time in return for fixed payments. (For information on this type of lease see 36 CFR 17 and 18.)

4. **Letter of Authorization** A document issued by a designated NPS official in a letter format that allows the bearer to receive privileges, take actions, or engage in prescribed activities authorized within an NPS area. These letters are issued only for minor, short-term, nonrepetitive, and specific activities. A copy of each letter citing the authority for the activity and including the finding that a short-term special use permit is not appropriate must be filed in the park's final decisions and orders file. The letter of authorization should not be used as a shortcut in place of a more appropriate permitting form or format. (For information on this type of permit see NPS-53.)

5. **Cooperative Agreement**

6. **Interagency Agreement**

7. **Memorandum of Understanding**

8. **Memorandum of Agreement**

   See definitions for 5-8 in Chapter 5, Interagency Agreements. Also see NPS-20, the Federal Assistance and Interagency Agreement guideline.

9. Some NPS units arrange for the Bureau of Land Management or Forest Service to administer their grazing permits on behalf of NPS. The permits used by the agency that is assisting NPS in administering the grazing program should be that agency's standard license, permit, or lease.

Permits should stipulate the conditions under which grazing can be carried out in the individual park. Permits should allow flexibility to respond to changing environmental conditions.

The following are some of the topics that should be considered when drafting a grazing permit:

1. Type of livestock
2. Number of stock
3. Period of time when grazing can take place
4. Area or site that can be grazed
5. Permit holder's responsibilities
6. Park's responsibilities
7. Number of seasons that the permit will cover
8. Fee or charge for the permit
9. When and to whom the fees are payable
10. Type of grazing activity
11. Ownership and maintenance responsibilities for developments

If a cooperating agency is managing a park's grazing, the park should review the permits that are being issued to ensure the items above are covered. NPS permits and leases are, in most cases, not transferable. In most cases grazing permits cannot be sub-let, sold, or transferred. They can be reissued to a different party but this is done at the discretion of the NPS, not the permit holder.

Awarding of permits There are no set guidelines as to how to decide who should have grazing permits on NPS lands. In many cases the privilege to graze in a park was established by legislation but in other cases a competitive selection process for leases may be the proper approach. Consult with the regional grazing coordinator, park administrative officer, and possibly the regional solicitor if this is an issue.

IX. Fees

The government expects to get "fair market value" when it establishes fees for the use of government resources. Fair market value for grazing varies greatly for a variety of reasons. Some fees are set by legislation, some are set by the Secretary of the Interior, some are established by appraisals, and some are arrived at by competitive bidding. There is no single procedure for establishing grazing fees. Each situation will have to be reviewed. Request assistance from the

regional grazing coordinator and park administrative officer when considering grazing fees. In many cases the Solicitor's Office will need to review the park's program for grazing fees.

X. Livestock Trespass

The 1987 Natural Resources Assessment and Action Program report identified trespass grazing in 49 parks in all 10 regions. This was the fifth most frequently identified threat of all those identified in the report.

By definition, the running-at-large, herding, driving across, allowing on, pasturing, or grazing of livestock of any kind on park lands without an authorizing permit is considered livestock trespass and is prohibited under 36 CFR 2.60. This is a legal answer to trespass but in many cases it has failed to resolve trespass problems.

Most parks are unfenced or only partially fenced, so livestock trespass is often difficult and confusing to resolve. Parks are advised to consider all alternatives before issuing citations for trespass. Working in cooperation with neighboring ranchers and farmers to eliminate trespass offers one alternative that has worked for many parks. Nevertheless, the construction of fences or barriers to exclude livestock may still be necessary. Parks that are managing their grazing in cooperation with the BLM or USFS may be able to use some of the administrative options these agencies have for dealing with livestock trespass. It is always advisable to examine the alternatives for resolving trespass issues before proceeding with legal options.

Legal options include the suspension or revocation of a permittee's permit or license as provided for in 36 CFR 2.60(b), the impoundment of trespass livestock as provided for in 36 CFR 2.60(c), and the issuance of a citation.

If it is determined the only recourse is to issue a citation, the NPS is prepared to support this action. Parks that issue citations for livestock trespass have been successful in prosecuting only when they have a well-prepared case to present. When it has been decided that issuing a citation is the proper way to deal with a trespass situation, consult with the regional law enforcement specialist and grazing coordinator. If they concur, it is usually also appropriate to request support and advice from the U.S. Attorney that provides support for the park. The same information needed for a citation is also needed by BLM and the USFS if they are to act on an NPS trespass complaint.

XI. Trespass Grazing Investigation Checklist

1. Owner of livestock: address(es) and phone number(s)

    a. How was ownership determined (e.g., brand markings, ear tags, interviews, etc.)?

    b. When was it determined?

c. Who determined ownership: name and title?

d. Tenant, manager, agent, or other person responsible for management of the livestock: name, address, phone

2. Date(s) trespass observed

a. By whom was trespass observed: name or names and title?

b. Was park notified of trespass by third party: name, date, time, how notification made, by whom received, substance of conversation or other communication?

c. Other witnesses to trespass(es): names, addresses, phone numbers

d. Date owner of livestock or his agent notified: who notified, how notified, substance of conversation, efforts of owner to abate trespass

3. Livestock

a. Type of livestock (e.g., cattle, cow/calf units, horses, etc.)

b. Exact location of trespass when first observed and at each succeeding observation: how and by whom determined

c. Number of livestock counted on each day and by whom

d. Exact point of access to park lands and how access was gained (e.g., hole in fence, open gate, no fence): how and by whom determined?

e. Was boundary fenced at point of entry? If so, what type of fence?

f. Type of land outside of park boundary where access occurred (e.g., fee land, grazing lease from whom, road, national grassland)

g. Where livestock came from lands not adjacent to park boundary, type of land and approximate distance from park

h. Owner of land outside of park boundary where access was gained

i. How was boundary marked and was it surveyed (e.g., brass survey caps, fencing, signs)?

j. Evidence of willfulness, negligence, or innocence on part of owner or agent (e.g., fence out or vandalized, gate open)

k. When, where, and by whom was fence last repaired in vicinity of point of entry?

l. What was the intervening weather between the time of the trespass and the time the fence was last observed in good condition? Was it the type which might have caused a break in the fence?

m. Describe the efforts of the government to abate the trespass: dates, number of workers, etc.

4. Damages

a. Description of damages to park property: forage consumed, injury to land, damage to fences and gates

b. Estimated monetary damage: direct and indirect costs including costs of rehabilitation of land, fence repairs, pro-rata salary of employees and office expenses, other

c. Nature of forage in trespass area and area's carrying capacity

d. Measure of damages by AUM method and current commercial values for an AUM

e. Who determined value of damages: name, title, qualifications?

f. Was damage billed: when, to whom, amount, response?

5. History of past trespasses

a. Was this the first trespass by livestock belonging to this owner? If not, what were the previous dates, locations, types, and amounts of damages?

b. Who has personal knowledge of previous trespass, or location of written records?

6. Agency recommendations

a. Most effective manner in which to abate future trespass (e.g., monetary damages, hold livestock until payment of damages, criminal action)

b. Ability of owner to pay monetary damages (source of information)

XII. Trail Stock

Trail stock, also called pack and saddle stock, are horses, mules and, recently, llamas used by the NPS, concessioners, and recreationists to carry people and supplies into the backcountry and on trail rides. They have been used historically in many parks throughout the System. The use of trail stock is recognized as a traditional type of recreational use in some parks and as a useful management tool in some situations. Trail stock are addressed in NPS Management Policies under grazing (8:14-15) and wilderness (6:9). NPS regulations concerning trail stock can be found in 36 CFR 2.16, Horse and Pack Animals.

Since resource impacts from trail stock can be very significant, this use should be carefully managed. Natural resource impacts from trail stock use may include soil compaction, erosion, denudation in camp and rest areas, localized sanitation problems, and vegetation impacts from grazing. There also may be recreational conflicts between horse users and backpackers.

Parks with trail stock use should manage it through a stock use management plan. This could be part of another plan such as the backcountry or wilderness management plan or as a separate plan, depending upon level of use and complexity. Plan development and monitoring should include involvement with user groups and the public to the fullest extent possible.

A stock use management plan should include the following types of information:

1. **Background Information** includes a description of the resource and a history of stock use and related impacts or conflicts in the park and surrounding area as well as its historical management.

2. **Trail Stock Defined.** Each superintendent should designate which animals are allowed as pack animals in each park. Animals currently being used for pack animals include horses, mules, burros, llamas, and goats. This should also include the types of use found and authorized in each park, such as:

   - day rides by private or commercially guided parties;
   - overnight pack trips by private or commercially guided parties;
   - walking parties leading burros, llamas, or other pack animals; and
   - spot trips where parties are packed into the backcountry and dropped off and the stock taken out.

3. **Pack in Feed or Allow Grazing.** Each superintendent should make the determination of whether or not grazing will be allowed in all or part of the park. Management Policies (8:15) encourages the use of pack-in feed where practicable and requires it

where grazing stock would have adverse impacts on natural resources. However, trail stock are a noted source of exotic plant seeds through packed-in food or from manure dropped after feeding outside a park. Certified "weed free" hays are difficult to find in some regions and are not guaranteed to be 100% weed free. In addition, these are not "seed free" and still contain the viable seeds of the hay plants (timothy, alfalfa, etc.) which are often not native in the park. Pellets are preferable pack-in feed. While these can be "hot" feeds for horses and they often have viable seeds, they are not as prone to spreading as hay bales.

If grazing is allowed, the following should be determined and incorporated in the plan:

- Opening and closing dates for use should be determined based upon plant phenology to minimize impacts on vegetation. This may vary for different areas in a park.

- Use levels should be established for each forage area in the park. This may be in the form of animal unit months (AUMs) or stock nights per forage area or per acre of forage area.

- A monitoring system should be developed and implemented to monitor the effects of grazing on vegetation. Techniques would be the same as described in other parts of this section.

4. **Stock Facilities** include trails and trailhead and backcountry facilities that should be addressed in the plan, such as the following:

   - Designated trails and routes for stock use. It is recommended that these be separated from hiking trails where possible.

   - Trailhead loading chutes, corrals, stock trailer parking areas, loading docks, and campsites.

   - Designated backcountry stock camps, hitch racks at attraction sites and camps, bridges, drift fences, and possibly designated pastures.

5. **Party Management** techniques that should be addressed include the determination of:

   - Party size, including the maximum number of head per group as a total of both riding stock and pack stock.

   - Length of stay per campsite and per management unit or area.

- Total number of parties per unit or area at one time and possibly for the season, if that can be determined.

- Total number of stock per area.

6. **Stock Practices** are those needed to manage stock and to minimize their impact on natural and cultural resources. Recommended practices include:

   - Tying animals overnight using hitch racks, where supplied, or putting up a rope hitchline between two trees on hardened, non-vegetated soil. Tying animals directly to trees should be prohibited. Where grazing is authorized, it is recommended that only one or two wrangler horses be tied overnight while letting the others graze.

   - While not specifically prohibited, use of picket pins is not recommended, because if not used correctly and moved frequently they can cause local overgrazing and trampling.

   - Other acceptable methods for holding stock include temporary rope corrals, hobbles, cheeking, drag, and portable electric fences.

   - A policy for manure spreading should also be addressed in the plan.

7. **Standards for Commercial Operations** should be addressed in the plan, where needed. These should include:

   - base camp operations,

   - guide-to-client ratios,

   - the maximum number of pack animals per packer string,

   - training of guides and packers, and

   - client education on minimum impact techniques.

8. **Standards for Administrative Stock Use** should include:

   - standard tack,

   - corral operations,

   - animal care,

- employee certification and training, and
- minimum impact techniques.

Monitoring and Plan Modification. A method should be established for monitoring stock use as well as associated impacts. This could include a permitting system and site monitoring system which could establish a baseline before the plan is implemented. If monitoring indicates a need to modify management practices, those modifications should be made after working together with user groups and the public.

XIII. Reports

Annual grazing reports are due to the regional office in May of each year. Regions consolidate the information and report to the Washington Office in June of each year. The Washington Office maintains a Servicewide grazing data base. The annual report serves to update that data base.

Information in the report includes the type of grazing (see Policy and Program Objectives, above); the status of planning documents and agreements on grazing; monitoring of use levels and resource condition; the status of and need for structural developments and fencing; and program costs and fee revenues.

ROLES AND RESPONSIBILITIES

I. Park

The primary role of the **superintendent** is to direct the development of the grazing management plan, approve the plan, send it to the Regional Director for approval, and then implement the plan. The superintendent also coordinates the NPS grazing plans with neighboring federal, state, and local agencies, and private citizens.

The primary role of the **park resource manager** is to develop and implement a grazing management plan that ensures the protection of park resources.

II. Region

Regional office program managers ensure that the grazing management plan conforms to NPS policy and provide technical assistance if needed. **Regional Directors** approve grazing management plans that conform to NPS policy and ensure that training funds and courses are available commensurate with the needs and demands for grazing management training.

III. Washington Office

Washington Office program managers (Ranger Activities and Wildlife and Vegetation Divisions) oversee the implementation of NPS grazing policy and develop new policy as warranted. They provide technical assistance to the regional program managers and superintendents. They also represent NPS concerns when dealing with other agencies on policy.

The **Washington Office Directorate** leads the effort to eliminate grazing in parks where it does not conform with NPS policy. They support the Regional Directors in providing training courses and funds for training requirements, needs, and demands.

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HUNTING AND TRAPPING

This section describes the conditions under which nonsubsistence hunting and trapping use may be permitted in certain parks and the actions which should be undertaken in order to manage these activities, conserve the park's natural resources, and protect the integrity of natural ecosystems. Management of subsistence hunting and trapping and control of exotic species are addressed in other sections of this Guideline.

POLICY AND PROGRAM OBJECTIVES

The NPS Management Policies states that:

> Hunting, trapping, or any other method of harvesting wildlife by the public will be allowed only in parks where it is specifically authorized by federal law. Where such an activity is authorized on a discretionary basis under federal law, it may take place only after the National Park Service has determined that the activity will not compromise public safety and enjoyment and that the proposed use is consistent with sound resource management principles. (8:4)

At a minimum, superintendents must ensure that harvestable species populations can support harvest pressure and that hunting and trapping activities do not degrade the resources and ecosystems within the park. (See also, Management Policies 4:7)

While hunting is usually practiced as a recreational activity, the collection of bounty, sale, barter, or exchange of native animals, including their parts or products obtained through lawful hunting or trapping in a park is a commercial activity, except in the case of specifically authorized traditional uses, such as subsistence in Alaska. Hunting guide services are also a commercial activity and should be administered in accordance with applicable NPS policy and guidelines (including NPS-48, the Concessions guideline). In some parks, the special use permit is issued for hunting or trapping. NPS-53, the Special Park Uses Guideline, should be consulted regarding special use permits.

AUTHORITIES

In addition to the general authorities discussed in Chapter 1, see also 36 CFR 1.4, 2.2, 2.4, and 13-Subpart A.

RELATIONSHIP TO OTHER GUIDANCE

NPS-9, the Law Enforcement guideline, should be consulted for further information on law enforcement aspects of hunting and trapping programs. NPS-48, the Concessions guideline, should be consulted regarding the commercial use aspects of authorized hunting and trapping. NPS-53,

the Special Park Uses guideline, should be consulted regarding special use permits as they relate to hunting and trapping. See also in this Guideline Chapter 2, Vegetation Management, Native Animal Management, and Exotic Species Management; and Chapter 3, Subsistence and Other Traditional Uses.

PROGRAM GUIDANCE

Authorized hunting and trapping programs in National Park System units must be permitted only after it is determined that the activity is consistent with sound resource management practices; the target species population must be able to support harvesting pressure. Superintendents should obtain the necessary data or initiate studies to determine population trends, habitat conditions, appropriate harvest levels and seasons, participant levels, and harvest success. All hunting and trapping activities allowed pursuant to special regulations should be addressed in the park's approved resource management plan.

Hunting and trapping activities must be in compliance with federal law and the laws of the state within which the park, or portions thereof, are located. However, this does not preclude the superintendent from exercising his/her authority to make bag limits, seasons, or areas more restrictive to ensure protection of park resources. Shifts in age structure or population recruitment are examples of instances where limits may need to be more restrictive. Where other equally or more significant purposes are identified (e.g., visitor enjoyment, protection of historic features, protection of other species), a more conservative harvest is appropriate. Public safety is of primary concern. Areas of high visitor use may be closed to hunting and trapping activities when the superintendent determines that such activity is not consistent with public safety and enjoyment.

Efforts to increase the sustainable yield of target species by manipulating, altering, or otherwise improving habitat or stocking target species are not approved practices unless authorized by law. Native predators may not be manipulated, controlled, or eradicated for the purpose of increasing harvestable species population numbers. Threatened and endangered species should be afforded maximum protection so as not to be adversely affected by hunting and trapping activities, either directly (i.e., accidental shooting) or indirectly (i.e., overharvest of prey species, change in movement or behavior of protected species due to disturbance).

Adequate control over harvesting activities, including the use of checking stations, area signing, enforcement patrols, and registration systems, should be considered when managing this program. Vehicular/vessel use must be limited to established policy and regulation. Access routes should be indicated clearly on informational brochures, and maps should clearly illustrate designated hunting and trapping areas.

ROLES AND RESPONSIBILITIES

I. Park

The **superintendent** is responsible for managing authorized hunting and trapping within a park and for developing appropriate field studies and investigations to determine at what level hunting and trapping will be permitted. Environmental compliance should be addressed as appropriate or required. This includes consultation with appropriate federal, state, and tribal authorities, as well as the general public.

II. Region

The **regional office** is responsible for the review and approval of appropriate field studies and investigations in a park to determine at what level hunting and trapping will be permitted, and for review of park hunting/trapping management programs.

III. Washington Office

The Washington Office, through the **Ranger Activities** and **Wildlife and Vegetation divisions,** provides guidance and oversight through review of park resource management plans and through overall implementation of NPS policy and of this Guideline.

REFERENCES

U.S. Fish and Wildlife Service, Division of Ecological Services. 1986. Habitat Evaluation Process (HEP). ESM 102. Department of the Interior, Washington, D.C.

Schemnitz, Sanford. 1980. Wildlife Management Techniques Manual. The Wildlife Society, Washington, D.C.

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MINERALS MANAGEMENT

Minerals inside parks encompass oil, gas, coal, geothermal resources, gold, talc, sand, and gravel, and other inorganic substances. Extraction and development of such substances in parks is governed by the NPS mandate to preserve and protect parks for the enjoyment of future generations. This section explains the conditions under which mineral development may occur on lands and waters in parks and highlights the importance of mineral ownership in determining whether minerals may be available for development. The section describes measures to manage and control mineral development and to protect park resources, purposes, and values.

DEFINITIONS

For purposes of this section, mineral interests that may occur in parks are divided into three categories, defined as follows:

Mining claim A valid claim that has been located pursuant to the Mining Law of 1872 provides the holder with the right to develop federal minerals on a tract of land. All units of the National Park System are closed to new claim location. However, several parks are encumbered by mining claims that were located before the land was withdrawn from mineral entry. Two basic categories of mining claims exist: (1) unpatented mining claims, in which claimants have a legal right to develop the minerals and use as much of the surface of the claims as is needed to develop the minerals, and (2) patented mining claims, in which claimants gain full ownership of the surface and subsurface of mining claims through an application procedure.

Federal mineral lease A mineral lease issued pursuant to the Mineral Leasing Act of 1920 or the Mineral Leasing Act for Acquired Lands of 1947 provides the lessee with the right to extract the federal mineral. Congress authorized the issuance of federal mineral leases under specified conditions in three units (Glen Canyon, Lake Mead, and Whiskeytown NRAs). Some other parks contain federal mineral leases issued before the lands were incorporated into the National Park System.

Nonfederal ownership of minerals All minerals owned by entities other than the United States constitute nonfederal minerals. Individuals, corporations, local and state governments, and Native corporations may hold a property interest in part or in toto in such minerals. All of the above mineral interests are legally recognized private property rights protected by the due process and just compensation clauses of the U.S. Constitution.

POLICY AND PROGRAM OBJECTIVES

The NPS Management Policies states that:

> Mineral development includes exploration, extraction, production, storage, and transportation of minerals. Mineral development may be allowed in parks only where there are existing

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FISHING

At least one-third of the NPS units have substantial fish resources and fishery activities. In many of these areas, park managers must deal with commercial, subsistence, or recreational fish harvest. NPS management policies for fisheries provide for a common set of management objectives for all natural, cultural, and park development zones which is directed at the maintenance of natural populations of native species and their habitat. In special use zones, management objectives may not need to fully meet this goal.

The following guidelines are intended to provide clarification and specific requirements for managers to carry out the stated fisheries management policies with respect to such issues as exotic species, stocking, commercial harvest, traditional use, fisheries restoration versus enhancement, and maintenance of genetic integrity. According to 36 CFR 1.4, the term "fish" includes any member of the subclasses Agnatha, Chondrichthyes, or Osteichthyes, or any Mollusk or Crustacean found in saltwater.

POLICY AND PROGRAM OBJECTIVES

I. Recreational Fishing

The NPS Management Policies states:

> Recreational fishing will be allowed in parks where it is authorized by federal law or where it is not specifically prohibited and does not interfere with the functions of natural aquatic ecosystems or riparian zones. Where fishing is allowed, it will be conducted in accordance with applicable federal laws and treaty rights and state laws and regulations. However, the National Park Service may restrict fishing activities whenever necessary to achieve management objectives outlined in a park's resource management plan. (8:4)

Recreational fishing has been permitted in national parks since the establishment of Yellowstone in 1872. Over the years, the NPS Organic Act has been interpreted as permitting recreational fishing as a means of providing for the enjoyment of parks. Recreational fishing in national parks is managed under 36 CFR 2.3. Congress has declared (Redwoods Act and General Authorities Act) that all NPS units are parts of a national system and that no action shall be taken in derogation of the values and purposes of that system unless specifically authorized by Congress.

However, the activity of recreational fishing is generally resource consumptive and, if not closely regulated, inconsistent with resource preservation philosophies. Park managers should recognize that once the harvest of fish resources is permitted, some degree of alteration of the aquatic ecosystem will occur.

A. Natural, Cultural, and Park Development Zones

The NPS Management Policies states:

> In natural, cultural, and park development zones, fisheries management will seek to preserve or restore natural aquatic habitats and the natural abundance and distribution of native aquatic species, including fish, together with the associated terrestrial habitats and species. (4:8)

This policy means that superintendents should strive to preserve or restore the natural behavior, diversity, and ecological integrity of fish populations in fulfilling their fishery management responsibilities. Managers should also give strong consideration to protection of nonfish aquatic species under this policy. Naturally fish-free waters should not be considered "barren." Their assemblages of aquatic insects, amphibians, and plankton can be significantly altered by the introduction of fish.

When harvest is permitted, the superintendent should determine a permissible harvest level based upon the species, its biological characteristics, and reproductive potential; but, in no case, should harvest be allowed to reduce the reproductive potential of the population or to radically alter its natural (unfished) age structure. The fisheries management goal should not be to maximize sustainable harvest, but to determine an optimum harvest level based upon biological balance and integrity as well as the quality of the fishing experience. In evaluating permissible harvest, superintendents should recognize the potential for adversely impacting other park fish and wildlife. Consideration should also be given to ecological impacts on associated aquatic and terrestrial organisms that prey upon or utilize native fish, and to the effects of fishing activity on other resources, such as trampling of vegetation, compaction of soil, and disturbance of sensitive wildlife.

Fishery managers must also be sensitive to potential genetic alteration of the stock. Native gene pools and the genetic diversity of Pacific salmon, steelhead, and trout species are known to be threatened by fishery management practices involving the outplanting of hatchery fish (Kelly et al. 1990; Miller et al. 1989). Hatchery fish can interbreed with wild fish, affecting the genetic integrity of wild fish stocks. It is also very easy to overharvest wild fish stocks in a mixed stock sport or commercial fishery involving both wild and hatchery stocks. This occurs when the wild fish stock cannot sustain the same high level of harvest as large numbers of hatchery fish which are indistinguishably mixed with it. It is also possible that components of a population can be depleted by harvest that targets on a genetically distinct segment. This can occur when the harvest is concentrated at a particular time or area that may be associated with spawning activities. See also Chapter 2, Native Animal Management and Vegetation Management. Both subchapters contain several pages of expanded discussion defining genetic diversity and integrity and explaining why those characteristics are important to protect in wild populations of animals and plants.

Managers should also give consideration to the establishment of restricted waters in which no fishing is allowed. These areas can be valuable for the study of unaltered ecological processes and serve as important baselines or control areas for harvested populations of fish.

The current policy for fisheries management within natural, cultural, and park development zones emphasizes the restoration and preservation of natural assemblages of **native** species. However, in some instances, stocking done decades ago, possibly predating the establishment of the park, has introduced species which have become well established and ecologically balanced within their aquatic community. Often these are highly desirable species to the recreational fishing visitor, and there is strong local support for managing them. Designating as special use zones areas around all water bodies where these species occur is usually not practical. Under such circumstances within natural, cultural, and park development zones, management actions that encourage the survival of a fishery for an exotic species, such as limits on catch, may be permitted only with a waiver of policy granted by the Director.

If a superintendent receives a policy waiver permitting such management of an exotic species of fish, he/she should clearly state that intent within the park's statement for management, resource management plan, and other such public documents. Such declaration does not override consideration for and perpetuation of other native species within the park, in accord with the NPS Management Policies and in compliance with the National Environmental Policy Act and other pertinent legislation.

The emphasis in NPS sport fishery management should be to maintain a naturally functioning aquatic ecosystem, protect and perpetuate native aquatic species and natural habitats, and allow recreational fishing activities only when ecosystem impacts are minimal.

Beyond ecosystem concerns, management emphasis should be based upon the recreational fishing experience and preservation of the opportunity for fishermen to enjoy the natural aquatic environment, not on fish harvest. Catch-and-release-only regulations should be considered by superintendents, whenever implementation is feasible, to minimize alteration of natural ecological processes. Area zoning is encouraged to provide a choice of catch and release, fly fishing, artificial lure, and/or limited harvest, as well as to avoid gear conflicts.

What fishermen perceive as a "quality fishing experience" may vary greatly among parks, geographic location, water body type, targeted species, and social composition of the fishermen. This perception is normally influenced by the following factors:

- the opportunity to fish for a wild fish,
- the naturalness of the aquatic setting,
- the size of fish caught,

- species caught,
- the number of fish caught per unit of effort, and
- the number of other fishermen encountered while fishing.

Superintendents should periodically conduct sociological studies involving surveys of fishermen using the park resource to determine what is most perceived as a quality experience to individual user groups.

Authorizations of commercially guided sport fishing operations, and monitoring of such operations should be scrutinized closely. These types of operations will likely have different effects on fishery resources than independent sport fishing.

Fishing tournaments, rodeos, and other such competitive recreational fishing activities are not generally compatible with the goals and objectives of fisheries management within NPS natural, cultural, and park development zones. Such tournaments should be considered a special park use that requires permitting in accordance with the NPS Management Policies. Such activity may be permitted only if the activity is clearly authorized and only if its occurrence has been judged by the superintendent not to cause any derogation of the values and purposes for which the park was established.

B. Special Use Zones

The NPS Management Policies describes special use zones as zones that:

> include lands and waters that the National Park Service anticipates will continue to be used for activities not appropriate in other zones. Types of special use subzones include commercial, exploration/mining, grazing, forest utilization, and reservoir. (2:8)

Examples where special use designations are applicable for fisheries related activities include:

> Reservoirs, and in some cases channelized or otherwise manipulated rivers and streams [that] represent altered environments that may reduce populations of some native species of fish and encourage others....The new ecological environments and niches created by the alteration of natural waterways may be most successfully filled by exotic fish species; nevertheless, management activities will give precedence to native [fish] species over exotics wherever natives are adaptable to the altered environment. (4:8)

Care must be taken to ensure that management of fisheries in special use zones does not impact other zones.

Specific management objectives and level of permissible harvest may vary widely depending on legislative mandates, Congressional intent, and specific agreements with state fishery management agencies. In some instances the management goal may be to maximize harvests through the use of enhancement techniques such as fish stocking or artificial habitat improvement measures. Where the enhancement of fish species for fishing is authorized, such as in some national recreation areas, and where stocking of exotic fish species has historically occurred, stocking for the same species may be continued, or a new species introduced, only if scientific data indicate the stocking will not be detrimental to native plant and animal species and the exotics will not spread out of the special use zone. (Management Policies 4:8) (See Authorities and Fish Stocking, below.)

Fisheries within NPS reservoirs and other special use zones are often managed jointly with other agencies, usually state fish and wildlife agencies. Policies and objectives often differ between these agencies and the NPS. It is essential that specific memorandums of agreement be developed between the NPS and these agencies for consultation related to fish management. Comprehensive fishery management plans should be developed for such zones to fully realize the impacts on native aquatics from introduction, enhancement, or protection of non-native species. (See Chapter 5, Interagency Agreements.)

II. Commercial Fishing

The NPS Management Policies states:

> Commercial fishing will be allowed only where specifically authorized by federal law or treaty right. (8:4)

Like any fishery, commercial fishing can disrupt natural distributions, densities, age structure, and behavior of fish and native wildlife that rely on fish for food. However, unlike a recreational fishery, commercial fishing does not provide for public recreational enjoyment of the resources, and is an inappropriate use of parks. Unless specifically authorized, it is prohibited within all use zones. Superintendents should discontinue or phase out commercial fishing in those parks in which it is not specifically authorized.

Where commercial fishing is authorized, superintendents should evaluate present and potential impacts, evaluate present and potential conflicts with recreational fishing activities, assess legal and jurisdictional mandates. They should also make every effort to ensure that growth in fishing effort, improvements in gear efficiency, and the introduction of new methods of targeting species not previously fished do not adversely affect park resources and the integrity of natural ecosystems.

Managers of those parks in which commercial fishing is authorized should balance allocation of the fishery resource with the needs of the aquatic ecosystem. In natural zones, allowable harvests should be restricted to levels that allow the maintenance of self-sustaining fish populations and that minimize impacts on other aquatic resources. All commercial fisheries management should be

based upon credible scientific data. All commercial fishing activities must be managed through permits and a harvest reporting system which addresses harvests within park boundaries.

III. Traditional, Subsistence, and Native Treaty Fisheries

Subsistence and native treaty fisheries are authorized in a number of NPS units.

In Alaska, subsistence fisheries are managed through provisions contained in the Alaska National Interest Lands Conservation Act (ANILCA, 1980), the federal law which established most Alaskan parks. The Alaska Board of Fisheries establishes subsistence seasons, bag limits, harvest methods, and means regulations for waters under its purview. In accordance with federal assumption of subsistence management on federal public lands in 1990, the Federal Subsistence Board establishes the same regulatory parameters for subsistence activities under its jurisdiction. Both boards use a democratic process involving user groups, subsistence users, a system of local fish and game advisory committees and regional councils, the Alaska Department of Fish and Game, and input from federal agencies such as the NPS in making these decisions. The federal government retains oversight authority for the management of subsistence fishing activities and subsistence fisheries on all Alaskan federally managed lands, including parks. Subsistence use receives a priority in allocation decisions when regional or individual fish populations cannot support the harvest demands of all user groups. If subsistence uses begin to threaten the health of specific fisheries, priorities are set among eligible subsistence users. Subsistence use in parks is described in more detail in Chapter 3, Subsistence and Other Traditional Uses.

Native treaty fisheries are present in several parks outside of Alaska. Unlike subsistence fisheries in Alaska, native treaty fisheries are usually based upon the aboriginal rights of Native Americans. Individual treaties establish the rights of individual native tribes to fish in NPS park units. Allocation decisions are frequently based upon a combination of court decisions and the biological recommendations of state, federal, and tribal fisheries managers.

Parks with a provision for traditional, customary use, historical (or other similarly worded) fisheries within their enabling legislation must immediately establish what constitutes a traditional fishery under the legislative provisions and include this determination in the unit's general and resource management plans. However, a legislative obligation to allow traditional, customary, or historical fisheries does not relieve the NPS of the responsibility for regulating and managing such use in accordance with other sections of this Guideline.

IV. Anadromous/Catadromous and Migratory Species

Many parks have fishery resources that occur within park boundaries during only a portion of their life cycle (e.g., juveniles only, adults only, or spawning) or that migrate seasonally. Often, these fish are exploited beyond park boundaries. Managers of these units should use available legal, scientific, and cooperative means to ensure self-sustaining fish populations which support natural ecosystem processes. Participation in cooperative management groups is encouraged and should

be used as a forum for presenting park concerns and goals. These units should collect scientific data to document the impact of these harvests on park resources.

V. Consultation and Cooperation

NPS management policies require that superintendents consult, as appropriate, with other federal land management agencies, the U.S. Fish and Wildlife Service, state agencies, Native American authorities, and others regarding fisheries management. (Management Policies 4:5). Many states require annual collection permits to collect game fish for research purposes in parks having other than exclusive jurisdiction. The policies further state that management programs directed toward the restoration and maintenance of habitats supporting harvested species and the stocking of species will be conducted through cooperative efforts with individual states under memoranda of understanding (Management Policies 4:7). When executing such memoranda of understanding, the park's legislative intent and stated management goals and policies of the Service cannot be compromised.

AUTHORITIES

Fisheries management in units of the National Park System is governed by the NPS Organic Act; General Authorities Act; Redwoods Act; regulations contained in 36 CFR; and each unit's specific enabling legislation. Other federal statutes that apply to the management of fisheries in the National Park System include the Endangered Species Act, the National Environmental Policy Act, the Wilderness Act, the Clean Water Act, the Wild and Scenic Rivers Act, the Fish and Wildlife Coordination Act, the Magnuson Fishery Conservation and Management Act, the Migratory Game Fish Study Act, the Salmon and Steelhead Conservation and Enhancement Act, and the Lacey Act.

A park's enabling legislation may specifically define what fishing activities are to be allowed within the park and what type of jurisdiction the management has with regard to the fishery. In those instances where a park has concurrent or proprietary jurisdiction, state laws and regulations also apply to the fishery. The federal manager, however, has the authority to implement more restrictive regulations. Should conflicts arise in instances where there is concurrent or proprietary jurisdiction, the more restrictive regulations can be applied or precedence of authority can shift to the higher level of government and NPS regulations would apply.

Parks with substantial marine habitat and saltwater fisheries should consult with the appropriate Regional Fishery Management Council and coordinate park management plans with those of federal and state Fishery Management Councils and agencies. Freshwater fisheries within NPS areas are often managed jointly with other agencies, usually state fish and wildlife agencies. Policies and objectives often differ between these agencies and the NPS. It is essential that specific memoranda of understanding be developed between the NPS and these agencies for consultation related to fish management. Comprehensive fishery management plans should be developed for such areas to fully address the impacts on native aquatics from introductions, enhancement, or protection of non-native species.

RELATIONSHIP TO OTHER GUIDANCE

This section is consistent with the 1988 National Recreational Fisheries Policy, which provides long-term common goals for conserving and restoring the nation's recreational fisheries. That Policy's guiding principles, goals, and objectives provide a conceptual foundation for each interest to build upon. The Policy suggests this is most effectively accomplished through a process of government-to-private sector cooperation and coordination among government agencies consistent with existing authorities and responsibilities.

Sections on Freshwater Resources Management, Native Animal Management, and Marine Resources Management in this Guideline (Chapter 2) should be consulted by managers in developing fishery management plans and to assist in resolving fishery management problems. If a park's fisheries program involves non-native species or threatened or endangered species, see NPS Management Policies and, in this Guideline, Chapter 2, Exotic Species Management and Endangered, Threatened, and Rare Species Management.

PROGRAM GUIDANCE

I. Inventory and Monitoring

The NPS Management Policies calls for the NPS to

> assemble baseline inventory data describing the natural resources under its stewardship and...monitor those resources at regular intervals to detect or predict changes...that may require intervention and to provide reference points for comparison with other, more altered environments. (4:4)

Thus, areas which have fishery management programs should quantitatively evaluate, on a regular basis, fish population characteristics including density, distribution, size, age structure, and/or angler harvest (creel surveys) to determine change. One of the goals of fishery management is to maintain a quality fishing experience for the angling public.

To meet this goal, each park should also periodically evaluate the sociological aspects of recreational angling to determine the perspectives of participants. Because of the variety of physiographic regions represented within units of the National Park System, specific inventory and monitoring methodologies will need to be determined by park management and should include habitat evaluation. (See section on aquatic habitat management in Chapter 2, Freshwater Resources Management. Also, for more information on inventory and monitoring, see Chapter 5, Inventory and Monitoring.)

II. Fisheries Restoration and Enhancement

In natural, cultural, and park development zones, fisheries restoration measures are strongly encouraged while fisheries enhancement activities are prohibited. Although fisheries enhancement may be allowed in special use zones, management should attempt to restore native species when it is feasible to restore habitat approximating natural conditions. (See Chapter 2, Vegetation Management, Native Animal Management, Freshwater Resources Management, and Marine Resources Management.)

Fisheries restoration refers to increasing the density of native fish species to historic levels through the application of scientifically-based harvest management, species reestablishment, habitat protection, and/or habitat rehabilitation (reconstruction) techniques.

Fisheries enhancement refers to procedures applied to a fish stock designed to increase the production or density of native fish above a level that could be produced naturally or to compensate for harvest.

Enhancement may be accomplished through employment of artificial or semi-artificial production systems (e.g., aquacultural and maricultural techniques such as fish and shellfish hatcheries, fish stocking, fish spawning channels, rafts and pens, etc.) or by an increase in the amount of productive habitat in the natural environment through physical or chemical modifications (e.g., fish ladders, beaver dam removal, lake fertilization, or specific habitat improvement measures such as the creation of pools, undercut banks, or boulder emplacement, where none originally existed).

Fisheries enhancement generally involves the manipulation of natural, undisturbed habitat or a population in order to artificially increase the presence or production of a species of interest. This may be contrasted with the restoration of habitat or reestablishment of a population eliminated, changed, and/or damaged by human use. The origin of the habitat or species condition being addressed must be documented before the Service can determine whether a proposed action or technique constitutes reestablishment, restoration, or enhancement. Habitat restoration and species reestablishment activities, although they may involve manipulation of the habitat, are directed toward re-creation of natural ecological conditions, while enhancement activities represent a deliberate manipulation of natural ecosystem processes for the express purpose of changing natural ecological conditions.

A. Fish Stocking

The NPS Management Policies states:

> In natural, cultural, and park development zones, fisheries management will seek to preserve or restore natural aquatic habitats and the natural abundance and distribution of native aquatic species, including fish, together with the associated terrestrial habitats and species. In these zones, waters that are naturally barren of fish will not be stocked with any species.

Artificial stocking of native fish will be employed in natural zones only to reestablish native species in their historic ranges; stocking of exotic fish species will not be permitted in natural zones. Stocking of native or exotic species will be permitted in cultural zones only where there is a special need associated with the historic events or individual commemorated and where an exotic species, if used, could not spread to natural zones or waters outside the park. Stocking with native species, but not with exotic species, will be permitted in park development zones. Stocking programs for other purposes in these zones will be discontinued or phased out except where there is congressional intent expressed in law or a House or Senate report accompanying legislation.

Reservoirs, and in some cases channelized or otherwise manipulated rivers and streams, in special use zones represent altered environments that may reduce populations of some native species of fish and encourage others. The National Park Service may cooperate with state fish and game officials to work out programs of stocking reservoirs and other altered waters, where authorized, for purposes of recreational fishing, using either exotic or native species, or both. Active fishery management programs will be encouraged in such waters.

...Management activities will give precedence to native fish species over exotics wherever native species are adaptable to the altered environment. Rivers and streams in special use zones may be stocked with exotic species of fish only when it has been determined that exotics already are present and established and where scientific data indicate that introducing additional exotics would not diminish native plant and animal populations and that the exotics could not spread to natural zones or to waters outside the park. (4:8)

The following guidelines should be adhered to where stocking activities are considered or deemed appropriate.

- Native species stocking into historic ranges is to be limited to the endemic genotype. If the endemic genotype cannot be acquired, then the most similar available genotype may be used (see Management Policies 4:10). Stocked fish should include representatives over the range of spawning time, migration patterns, age at maturity, and size whenever possible.

- When stocking in a cultural zone, research should have demonstrated that this activity will not alter the historic scene, cultural resources, or natural processes in adjacent natural zones or nonpark lands.

Within special use zones, reservoirs, and other bodies of water, NPS Management Policies allows for active fishery management, including stocking of native and/or exotic species, only where the introduction would not adversely affect native populations or where exotics would not spread to natural zones or adjacent nonpark lands. Such fish stocking programs should be developed in cooperation with state fish and game officials. Except for those actions for which the special use zone is designated (such as fish stocking), the resources within that zone are to be managed for

their protection and long-term perpetuation of natural processes as prescribed for natural zones. Special use zoning should not be used to create isolated enclaves within natural zones.

Superintendents contemplating the initiation of a stocking program must evaluate the process under NEPA (NPS-12) guidelines. Following the NEPA process will allow the park to assess impacts, inform the public, and solicit interagency comment. Where stocking is being conducted by other agencies adjacent to park boundaries, superintendents should contact those agencies and work out cooperative programs that will reduce the number or prevent stocked fish from entering park waters. The use of foreign broodstock, even though a native species, by other agencies in their hatchery programs, can threaten native gene pools and genetic diversity. Managers should use all available legal, scientific, and cooperative means to protect park resources from adjacent stocking programs.

B. Habitat Manipulation

> Interference with natural processes [habitat manipulation] in park natural zones will be allowed only (1) when directed by Congress, (2) in some emergencies when human life or property are at stake, or (3) to restore native ecosystem functioning that has been disrupted by past or ongoing human activities. (Management Policies 4:2)

Ecological processes altered in the past by human activities may need to be abetted to maintain the closest approximation of the natural ecosystem when a truly natural system is no longer attainable. In aquatic systems that have been designated special use zones, habitat manipulation may be used to restore or enhance habitat for purposes of maintaining or improving recreational fishing. Management techniques may include but are not limited to the construction of instream structures, the restoration of historic hydroperiods, fencing, and restoration of riparian zones. Project areas that have a long-term goal of returning the aquatic community to a near natural state should be designated as natural zones.

C. Fisheries Habitat Protection

Within the National Park System, the degree of watershed protection ranges from total to incomplete protection. Often a park does not control watershed areas upstream from the park, and land use activities in adjacent areas or private inholdings can impact fish populations and aquatic resources within the park. Superintendents should work cooperatively with private landowners and public resource land management agencies to ensure watershed protection so that outside land use practices have minimal impact on aquatic resources. (See Chapter 2, Freshwater Resources Management.)

D. Removal of Exotic Species

The encroachment of exotic (non-native) fish species into the range of native fish species is a prevalent NPS fisheries management problem. The displacement of native species by exotics should not be allowed if such displacement can be prevented by management.

> Management of populations of exotic...species, up to and including eradication, will be undertaken whenever such species threaten park resources or public health and when control is prudent and feasible. (Management Policies 4:12)

Methods to prevent the invasion or reinvasion of exotic fish may include, in order of preference, the use of natural barriers, the improvement of existing obstructions to create a barrier, the building of a fish barrier, and lastly, the use of mechanical or chemical methods.

Superintendents should give high priority to the management and control of exotic fish species that have substantial impact on native fish and associated aquatic organisms.

E. Restoration of Native Species

The decision to strive to restore native fish populations at the expense of exotic fish should be based on valid resource information obtained through research. Information needed includes but is not limited to:

1. the presence of or potential for restoring adequate habitat;
2. historic genotype availability;
3. the degree of human-induced change resulting in substantially reduced populations of native fish;
4. the feasibility of the effort; and
5. a determination that once the population is restored, it will become self-perpetuating.

Exotic species management is described in more detail in Chapter 2, Exotic Species Management.

ROLES AND RESPONSIBILITIES

I. Park

The **superintendent** has the primary responsibility to ensure that stated NPS fishery management policies are being followed within the park's fisheries management program and that waters in which stocking, fisheries enhancement, or exotic species management activities are occurring are

within the appropriate zone designation. Where the harvest of fish resources is permitted, the superintendent should assure that adequate technical expertise and funding are available to evaluate harvest impacts and establish needed regulatory controls.

Park staff with fisheries expertise should interact with and participate in federal and state regional fishery commissions and related fisheries planning/coordination groups in order to represent NPS concerns with respect to fisheries resources. Active membership in professional fishery organizations such as the American Fisheries Society is also encouraged.

II. Region

The primary role of the regional office is to provide oversight and guidance to superintendents in carrying out their fishery management programs. **Regional Directors** should ensure that park resource management plans conform to NPS fishery management policies and assist in resolving conflicts where political concerns will influence management decisions. The Regional Director approves park resource management plans and therefore their fishery management plans and programs.

The regional office should provide consultation when the application of stated policies and guidelines appears inappropriate or requires interpretation. The Regional Director should strive for a coordinated fishery management program among all parks within the region. Regional science funds should be utilized to develop fishery resource monitoring programs within all parks where harvest occurs, and parks should be required to incorporate such monitoring programs, once developed, into their base funding.

Regional staff with fisheries expertise should interact with and participate in federal and state regional fishery commissions and related fisheries planning/coordination groups in order to represent NPS concerns with respect to fishery resources. Active membership in professional fishery organizations such as the American Fisheries Society is also encouraged.

III. Washington Office

The Washington Office is responsible for providing approved guidelines for instituting stated policy and resolving problems of application. Where agency or Departmental policy conflicts are involved, resolution should be sought at the Washington level.

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I. Mining Claims

The **Mining Law of 1872** allows citizens to enter open public lands and stake a claim to lands which contain a valuable mineral. Minerals subject to claim location are referred to as "locatable" or "hardrock" minerals and include gold, silver, copper, lead, zinc, cinnabar, tin, talc, feldspar, antimony, bismuth, molybdenum, uranium, and various gemstones. Such minerals are made available to parties for development through the issuance of unpatented mining claims, which gives a claimant a right to develop the located mineral and use as much of the surface of the claim as is necessary for mineral extraction. A claimant can obtain full ownership of the claim (i.e., the rights to the minerals and all of the surface) through an application process to "patent" the claim.

The **Federal Land Policy and Management Act of 1976** requires persons holding unpatented claims to record the location of their claims with federal authorities and to file an annual notice with both local and federal offices by the end of each calendar year. Failure to record the claim or file an annual notice results in abandonment of the claim.

The **Surface Resources Use Act of 1955** prohibits persons from using the surface of unpatented claims for anything but mining.

The **Mining in the Parks Act 1976** closes all units of the National Park System to the location of new mining claims. The Act directs the Secretary to determine the validity of unpatented mining claims and to make recommendations regarding claim acquisition, and reinforces the Secretary's authority to acquire and regulate patented and unpatented mining claims in parks.

The **NPS regulations at 36 CFR 9, Subpart A (36 CFR 9A)** govern mining operations in parks in connection with the exercise of valid unpatented and patented mining claims. Nonmineral operations on patented claims are not subject to these regulations. The 36 CFR 9A regulations provide for the NPS review and approval of proposed operations prior to the commencement of mineral development. Approval of the plan of operations constitutes the permit for the conduct of operations. Special Use Permits are not issued for such operations.

Off-claim use. An operator may not use any lands outside the claim boundary except for access to the claim. Access includes facilities necessary to the operation such as roads, power, water, and communication lines.

Access to claims outside a park. An operator on a claim outside a park may not gain access across the park, except by foot, pack animal, or designated road. Under 36 CFR 9A, such access by designated road requires an approved plan of operations.

Access in Alaska. Different rules govern access in Alaska and separate permits may be required under 43 CFR 36. Further guidance should be obtained by contacting the minerals coordinator in the Alaska Regional Office.

II. Federal Mineral Leases

The Mineral Leasing Act of 1920 and the Mineral Leasing Act for Acquired Lands of 1947 provide authority for disposal of "leasable" minerals on federal lands. These laws prohibit leasing of federally owned minerals in units of the National Park System. However, the enabling legislation for Glen Canyon, Lake Mead, and Whiskeytown NRAs allows the Secretary of the Interior to lease minerals in these parks provided that certain conditions safeguarding park resources and values are met.

Operations on a federal mineral lease in a unit of the National Park System are governed by 43 CFR 3160 for oil and gas and by 43 CFR 3590 for solid leasable minerals. These regulations provide for the NPS review and consent on leases and operating permits prior to their issuance by the BLM. Enforcement of lease conditions or stipulations is the responsibility of the BLM, unless the BLM has formally delegated some or all of its enforcement duties to the NPS. A lease provides the authority for access to the area of operations. When the lease expires, disturbed park lands must be satisfactorily reclaimed unless otherwise stipulated by the NPS.

Pre-existing leases on park lands Several parks contain federal mineral leases issued prior to incorporation of the land into the National Park System. Such leases are governed by regulations at 43 CFR 3100 and 3500 and are managed by the BLM. The NPS consults with the BLM regarding operations on these pre-existing mineral leases, but the NPS consent is not required. When such leases expire they cannot be renewed or reissued.

Coal The Federal Coal Leasing Amendments Act of 1976 prohibits federal coal leasing in units of the National Park System. The implementing regulations are contained at 43 CFR 3400.2.

Geothermal The Geothermal Steam Act of 1970 prohibits leasing of federally owned geothermal resources in any unit of the National Park System, including the three parks specifically open to mineral leases. The Geothermal Steam Act Amendments of 1988 provide added protection for parks by requiring the BLM to obtain the NPS consent before issuing a geothermal lease on lands adjacent to listed parks. The regulations at 43 CFR 3200 govern geothermal leasing on lands adjacent to parks.

Indian Trust Lands Mineral leases may be issued on lands in parks held in trust for Indian individuals or tribes. The NPS consent is not required for leasing, and operations are managed by the BLM.

III. Sale of Federal Mineral Materials

Minerals that may be acquired by sale or free use permit are called "salable" or "common variety" mineral materials. Examples include petrified wood, sand, stone, gravel, pumice, pumicite, cinders, limestone, and clay. The Materials Act of 1947 prohibits the sale of such minerals in parks. However, the Secretary may sell for limited purposes sand, gravel, and rock to the residents of the

Stehekin community in the Lake Chelan NRA (30 USC 90c-1b). Special regulations to govern the sale of such materials in Lake Chelan NRA are under consideration.

IV. NPS Administrative Use of Mineral Materials

The Service may use sand or gravel or other mineral materials from existing borrow pits or new sources for park administrative purposes if, based on a written analysis, it determines that economic factors make the import of such materials totally impractical. Sources of mineral materials should be identified and evaluated in the general management and resource management plans of the park. Prior to the creation and use of new borrow sources, the NPS must obtain all applicable federal, state, and local permits and complete NEPA compliance. (See also, NPS Management Policies 9:4 and, in this Guideline, Chapter 3, Administrative Uses of Resources.)

V. Nonfederal Minerals in Units of the National Park System

Nonfederal mineral rights exist in units of the National Park System because: (1) the land, including the right to the mineral estate, was not acquired by the United States, or (2) in acquiring the surface estate, the United States allowed the grantor or the grantor's assignee to reserve the rights to the mineral resources.

A. Nonfederal Coal

The Surface Mining Control and Reclamation Act of 1977 (SMCRA) prohibits coal mining in units of the National Park System subject to valid existing rights. If an individual is found to have a valid existing right to mine coal in a unit of the National Park System, the applicable state regulatory program under SMCRA will guide operations. In states that do not have a program for regulating coal mining, the Office of Surface Mining Reclamation and Enforcement is the regulatory authority.

B. Nonfederal Oil and Gas

Oil and gas rights in units of the National Park System can be owned by state or local governments, corporations, individuals, partnerships, Indian Tribes or Native Corporations. Only persons who own, lease, or have authorization from the owners or lessees of the oil and gas may conduct operations within the boundaries of a park.

The NPS regulations at 36 CFR 9, Subpart B (36 CFR 9B) are applicable to all nonfederal oil and gas operations in parks where access is on, across, or through federally owned or controlled lands or waters. Development of oil and gas on patented mining claims is governed by these regulations, not those contained at 36 CFR 9A. The 36 CFR 9B regulations require an NPS approved plan of operations prior to exploration and development. Persons conducting operations on January 8, 1979, are permitted, under certain limited circumstances, to continue operations without submitting a plan of operations.

C. Nonfederal Minerals Other Than Oil and Gas

This includes all minerals, mineral materials (e.g., sand and gravel), and geothermal resources that are nonfederally owned in units of the National Park System. For regulatory purposes, this class of minerals does not include any minerals found on patented mining claims.

The NPS currently does not have specific regulations governing the conduct of mineral operations in connection with nonfederal minerals other than oil and gas. Where the owner of nonfederal minerals in a park unit possesses a right to cross, use, or occupy the federal surface estate, the NPS will permit the mining operations under a Special Use Permit (Form 10-114). A Special Use Permit may be issued only to those persons who own or lease the minerals or who have authorization from the owner or lessee to develop such minerals. Before issuing such a permit, the Service must determine that the proposed development is not contrary to the park's enabling legislation or in derogation of park values and purposes.

All operations should be monitored to ensure that they are conducted and reclaimed in compliance with existing federal, state, and local laws and regulations. Also, the NPS should evaluate land uses and determine in the land protection plan for the park whether such mineral rights should be acquired or regulated.

VI. Other Mineral Authorities and Issues

A. Indian Trust Lands

The Secretary, through the BIA, may issue mineral leases on lands held in trust for Indian individuals or tribes where such trust lands exist in a unit of the National Park System. The NPS consent prior to issuance of the lease is not required. The BLM supervises the conduct of operations on these leases.

B. Collecting Minerals

Recreational collection or removal of minerals, such as rockhounding or gold panning, is prohibited in all units of the National Park System (36 CFR 2.1(a)) unless special regulations allow such collection based on provisions in a unit's enabling legislation or other legal authority which provides an exception to the prohibition. (Gold panning is specifically permitted in regulations for Whiskeytown NRA in California.) However, minerals may be removed if necessary for scientific research (36 CFR 2.5). Regulations at 36 CFR 2.1(c)(1) provide discretion to a superintendent to designate certain natural resources for personal gathering and use; however, this regulation does not provide authority to designate mineral resources that may be gathered.

In Alaska, collecting rocks and minerals for personal recreational use (which is regulated under 36 CFR 13.20) is permitted in all parks except within Sitka and Klondike Gold Rush NHPs and in the former Mt. McKinley, Glacier Bay, and Katmai parks. Persons can collect rocks and

In Alaska, collecting rocks and minerals for personal recreational use (which is regulated under 36 CFR 13.20) is permitted in all parks except within Sitka and Klondike Gold Rush NHPs and in the former Mt. McKinley, Glacier Bay, and Katmai parks. Persons can collect rocks and minerals only by using their hands or a gold pan on lands not under 1872 mining claims. Collectors cannot take silver, platinum, gemstones, and fossils. Minerals cannot be gathered as a subsistence activity in any Alaskan unit of the National Park System.

Native Americans are prohibited from removing rocks and minerals from units of the National Park System, except where use for religious or traditional purposes is provided for in treaty or statute. This prohibition does not apply on Indian Trust Lands in any unit of the National Park System. (See also, Chapter 2, Geologic Resources Management, Chapter 3, Subsistence and Other Traditional Uses, and Management Policies 8:15.)

C. Mineral Resources Assessments and Research

The NPS can only permit other federal agencies to assess federal minerals in units of the National Park System where specifically authorized by law (e.g., §1010 of the Alaska National Interest Lands Conservation Act of 1980) and in accord with regulations (e.g., 36 CFR Part 9, Subpart D) and the NPS Management Policies. Nonfederal entities may only conduct mineral assessments on nonfederally owned minerals according to the requirements of the NPS Management Policies and regulations at 36 CFR 2.5. Refer to the sections above for more information.

D. Abandoned Mineral Lands

Each NPS park should inventory abandoned mineral lands (AML) sites to identify safety hazards and resource impacts. The hazards and adverse resource impacts associated with abandoned mines should be eliminated as funding and personnel are available. Monitoring of abandoned mines should be ongoing to ensure safety and to minimize impacts on other park resources. Alternatives for treating mine openings include permanent closure, temporary closure, maintenance as wildlife habitat, or retention and interpretation as a historic feature. Abandoned oil and gas wells should be plugged to prevent contamination of the surface and ground water. All treatments of AML sites must be consistent with the NPS policies for the preservation of cultural resources, and satisfy requirements of NEPA, the National Historic Preservation Act, the Endangered Species Act, and other pertinent legislation. In parks where hazardous conditions exist, visitors should be given reasonable warnings through warning signs, verbal warnings, and written warnings in visitor guides. Such warnings should be sufficiently detailed so that a visitor can recognize the actual hazards present and make an informed decision to avoid them. Where appropriate, AML issues should be addressed in park management and planning documents.

E. Electric Power Transmission Lines

The Federal Energy Regulatory Commission is prohibited from issuing licenses, permits, or leases for transmission lines in any unit of the National Park System (16 USC 797a and 36 CFR 14.10).

However, the NPS may grant rights-of-way over, across, and upon federal lands in units of the National Park System for electrical poles and lines for transmitting electrical power as long as the Secretary determines that the granting of such rights-of-way are compatible with the public interest (16 USC 5). Electric power rights-of-way are granted under 36 CFR 14. (See also NPS-53, the Special Park Uses guideline.)

F. Oil and Gas Pipelines

The NPS and all other federal agencies are prohibited from issuing a right of way for an oil and gas pipeline across units of the National Park System (30 USC 185(b)), unless specifically authorized to do so in a park's enabling legislation. Parks with such authorization in their enabling statutes (e.g., Gulf Islands NS, Blue Ridge Parkway, and Gateway NRA) must issue rights-of-way under the conditions of the park's enabling legislation using the procedures in 36 CFR 14 with the approval of the Director. Parks in Alaska may issue rights-of-way for oil and gas pipelines consistent with the provisions of the Alaska National Interest Lands Conservation Act and according to the procedures found in the 43 CFR 36 with the approval of the Director. (See also, NPS-53, the Special Park Uses guideline.)

VII. Planning

Adequate planning for and management of mineral development activities requires an accurate data base, including details on mineral interests, land status, and mineral development potential. Mineral resource information should be integrated into the NPS planning process as follows. (See also, NPS-2, the Planning Process guideline):

Statement for Management (SFM) The SFM highlights minerals management issues and the NPS policy on these issues. It is important to identify tracts in the park with outstanding mineral interests, including nonfederal and federal mineral interests holding outstanding leases or permits for the development of those interests.

General Management Plan (GMP) The plan should identify specific sites where mineral development once occurred, is occurring, or is likely to occur and describe land use changes or resource impacts that could result from mineral development. Also, pertinent information on existing and potential mineral development on adjacent lands should be evaluated in terms of how it may influence resources within the park. The GMP should also discuss the presence or absence of federal or state regulatory tools available to the NPS to deal with identified direct or secondary impacts on park resources.

Resource Management Plan (RMP) The RMP should discuss minerals management issues in terms of the necessary manpower, money, and/or natural resource studies needed to manage mineral operations in the park. Such studies may include baseline studies of water or air quality, the status of vegetative communities, fish or wildlife populations, or noise studies. Existing studies should be reviewed to determine if parameters measured will help in assessing impacts from minerals

development in, or adjacent to, the park. The management of abandoned minerals lands and issues of safety, resource impacts, and historic features should be addressed.

Land Protection Plan (LPP) The LPP identifies whether acquisition of mineral interests is recommended. It establishes acquisition priorities for identified lands and interests. If acquisition is not recommended or is limited by statute, the LPP should evaluate the applicability of other management tools such as the NPS or other federal or state regulatory authorities, easements, or cooperative agreements with nonfederal entities to protect park resources.

Minerals Management Plan (MMP) In the few parks where mineral development is a significant issue and cannot be adequately addressed in the GMP, an action plan, or MMP, may be necessary. Generally, such a document will present specific operating procedures and requirements for mineral development in the park. Until specific guidance in NPS-2, the Planning Process guideline, is developed, consult with the Washington Office Mining and Minerals Branch before making decisions on an MMP.

Wilderness studies According to law, only federal lands are suitable for wilderness designation. Wilderness suitability studies should identify whether federal lands under study are encumbered by outstanding mineral rights.

Park boundary expansion studies Any study evaluating whether the authorized boundaries of a park should be expanded must analyze mineral ownership of affected lands, abandoned mineral sites, and the potential for future mineral development.

New area, river, or trail studies Occasionally, Congress authorizes studies of lands and waters for possible inclusion in the National Park System, Wild and Scenic River System, National Trails System, or other conservation areas. Accurate mineral resource ownership and other data are essential for evaluating land use impacts, management alternatives, land acquisition costs, and other general management recommendations to Congress.

ROLES AND RESPONSIBILITIES

I. Park

Each **superintendent** is responsible for ensuring that mineral development is conducted and abandoned **mines** managed in compliance with federal laws and regulations as outlined above. Regional and **Washington** Office staff are available to assist the superintendent.

II. Region

Each regional office has a designated **minerals coordinator** who is the key contact for the NPS field personnel on minerals related issues. The regional coordinators are aware of minerals issues existing in parks throughout the region. Field personnel may find that their specific mineral issue

is similar to one in another park in the region and that solutions have already been selected and/or tried in other parks. Minerals coordinators should also be aware of natural resource studies being conducted throughout the region that may prove useful to parks with minerals management issues. Also, the acquisition of mineral estates under the supervision of the Regional Land Resources Division should be well understood by the regional minerals coordinator. Thus, the regional minerals coordinator is the link between field areas, the regional chief scientist, the Washington Office Land Resources Division, the Washington Office Mining and Minerals Branch, and other Washington Office programs as needed. The Regional Director signs, or can delegate to the superintendent to sign, a finding of No Significant Impact for EA/EIS documents related to minerals plans of operation.

Because of the number and complexity of minerals issues in Alaska, the **Alaska Regional Office** has a Minerals Management Division to address minerals issues in Alaska parks. In addition, several Alaska parks have staff with minerals management responsibilities and expertise.

III. Washington Office

The **Mining and Minerals Branch** in the **Land Resources Division**, under the Associate Director, Operations, is responsible for oversight of the NPS minerals management program, including ensuring consistent application of procedures and adherence to laws, regulations, and policies. The Branch also provides technical guidance and assistance to regional offices and superintendents on minerals management issues. The Branch has mineral specialists representing a wide variety of disciplines.

Additional assistance relevant to minerals issues is available from the **Air Quality** and **Water Resources Divisions** under the Associate Director, Natural Resources. The **Environmental Quality** and **Park Planning and Protection Divisions** under the Associate Director, Planning and Development are also involved in minerals management issues in units of the National Park System. The **Ranger Activities Division** is responsible for reviewing and processing rights-of-way for the Director's approval.

REFERENCES

NPS Procedures for Managing Federal Mineral Leasing and Operations. 1984. NPS Washington Office Mining and Minerals Branch.

NPS Procedures Governing Mining Claims. 1988. NPS Washington Office Mining and Minerals Branch.

NPS Procedures Governing Nonfederal Oil and Gas. 1991. NPS Washington Office Mining and Minerals Branch.

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AGRICULTURAL USES

This section discusses the conditions under which agricultural uses can be permitted in parks, factors to consider in planning agricultural uses, and the three ways in which such uses can be implemented.

POLICY AND PROGRAM OBJECTIVES

The NPS Management Policies states:

> Agricultural uses and activities are authorized in parks in accordance with the direction provided by a park's enabling legislation and general management plan. However, agricultural uses and activities may not be conducted in natural zones. Agricultural practices and techniques, including the use of pesticides, are subject to the provisions of federal and state laws, NPS regulations and policies, and the Special Park Uses Guideline. In general, agricultural activities should be conducted in accordance with accepted best management practices. The National Park Service may issue leases or special use permits to individuals or organizations to conduct agricultural activities on park lands.
>
> Agricultural activities in cultural zones, including demonstration farms, will be allowed if (1) they conform to those that occurred during the historic period, (2) they do not result in the derogation of park values or purposes, and (3) they support the park's interpretive themes. Agricultural uses that do not conform to those in practice during the historic period may be allowed if (1) they are authorized by federal law, (2) they are retained as a right subsequent to NPS land acquisition, or (3) they contribute to the maintenance of a historic scene. Within agricultural subzones, certain agricultural practices may be allowed or restricted to achieve desirable land uses or NPS management objectives.
>
> NPS and concession employees living in parks may cultivate gardens for personal use in park development zones and cultural zones under terms and conditions established by the superintendent. Such use will not be permitted if it would deplete or pollute water supplies, adversely affect visitor enjoyment of the historic or natural scene, or result in the derogation of park values or purposes. In urban parks, areas may be designated for community recreational gardening under the same conditions. (8:14)

The following additional NPS Management Policies are also critical to management of agricultural activities in cultural zones:

> The management of cultural landscapes will recognize and protect significant historic, archeological, ethnographic, and design values. Treatment decisions will take into account both the natural and built features of the landscape and the dynamics inherent in natural processes and continued human and animal occupation. (5:6)

> A cultural landscape may be restored...if (1) restoration is essential to public understanding of the cultural associations of a park, and (2) sufficient data exist to permit restoration with minimal conjecture. (5:6)

Agricultural uses occurring consistent with the park's purposes should be supported by appropriate planning and management documents such as the general management plan, resource management plan, and the cultural landscape report.

AUTHORITIES

See discussion of general authorities in Chapter 1.

RELATIONSHIP TO OTHER GUIDANCE

Additional guidance on agricultural uses will be found in NPS-28, the Cultural Resources Management guideline; NPS-38, the Historic Property Leasing guideline; NPS-53, the Special Park Uses guideline; and Special Directive 82-6, Policy on Dead and Down Wood and Wood Products. In this Guideline, see Chapter 2, Vegetation Management, Native Animal Management, Freshwater Resources Management, Soil Resources Management, Protection of Aesthetic Values, Integrated Pest Management, and Public Health and Safety; Chapter 3, Grazing and Administrative Uses of Resources; and Chapter 4, Environmental Compliance. Also useful is 45 FR 59189 (1980) concerning prime farmland, and Executive Order 11990, concerning wetlands.

PROGRAM GUIDANCE

I. Reasons for Agricultural Uses

There are many reasons for agricultural uses within NPS areas, all of which must be grounded in legislation and policy. Aside from legislative requirements to permit or continue a particular use, agricultural uses in general fit into the following categories.

Cultural Landscape A cultural landscape may be preserved, restored, rehabilitated, or reconstructed to preserve and foster appreciation of cultural resources. The significance of the resource, its condition, its interpretive value, its research potential, and the availability of data should be weighed in determining the appropriate treatment.

Reservations of Use and Occupancy Agricultural uses may be required, or permitted, as part of uses and occupancy reserved by land owners when their property was acquired by the government.

Concessions Management It may be necessary to allow some agricultural uses, e.g., grazing, to support concessions operations required by park management.

Gardening Parks may permit gardening not associated with a cultural scene when the gardens are connected with employee residences or are part of community gardening programs consistent with the park's purposes (usually in association with "urban" parks).

Wildlife Habitat The NPS Management Policies states that vegetation cannot be managed for the purpose of creating wildlife habitat "to increase the numbers of a harvested species above natural levels, except where directed by Congress." (4:7, emphasis added) However, it may be possible to use agricultural practices, where otherwise allowable, as a mitigation measure to offset the loss of habitat caused by other management actions. In this case, the agricultural practice used to offset the loss of wildlife habitat is not intended to be an "artificial manipulation of habitat to increase the numbers of a harvested species" but rather a mitigation measure which is required by other management actions.

For example, agricultural practices could be employed to maintain an area in a condition similar to its condition prior to federal acquisition. In such cases, when the land owner relocated, the land would normally be allowed to return to a nonintensively managed condition. This change could cause an undesirable alteration of habitat which might be mitigated through agricultural practices.

II. Considerations in Agricultural Uses

When an agricultural use in a park is being considered, several items should be reviewed. Foremost among these are:

A. Pest Management

Modern agricultural uses rely heavily on the management and control of pests to help produce a crop or manage livestock. Practices generally applied in the private sector for pest management may not be consistent with the Service's integrated pest management policy, or they may be inconsistent with practices used during the historic period that is being recreated. Further, pests that occur today may not have been present historically. Refer to Chapter 2, Integrated Pest Management, for further guidance on pest management.

B. Historic Period

If preservation, maintenance, or restoration of a historic scene is the primary purpose of agricultural use, critical elements of the scene which are to be maintained should be identified by qualified cultural resource specialists. These may include specific patterns of vegetation structure, including various heights of crops, orchards, woodlots, and woodlands; field sizes and other landscape patterns; sites with certain species, such as a grove of mature trees; stone walls and other structures; topography; wetlands; springs, streams, and drainageways; and roads and traces. Certain of these elements may not be compatible with the economics of modern agriculture, and all factors should be carefully considered. All agricultural activity for the purpose of managing cultural landscapes

should be carried out in accordance with a Cultural Landscape Report prepared in compliance with NPS-28, the Cultural Resources Management guideline.

C. Historic Methods

In many parks, it is the goal of management to recreate the methods of production used during the historic period. While recreating early agricultural methods may be an excellent interpretive tool, their use is not always advisable. In particular, the methods used historically may not have been intended to perpetuate the landscape for future generations, making them inconsistent with NPS objectives.

Historic methods can also be impossible to recreate. Dry land farming is a good example. At one NPS unit, dry land farming was the method being implemented because it was used during the period being interpreted. Research revealed, however, that environmental conditions were significantly different during the earlier period, when the area had received three times as much rainfall.

In addition, historic techniques are often better simulated than actually employed. Most NPS units do not have the manpower or funds necessary to recreate the historic techniques used by farmers. For example, dry land farming at its most successful level requires replanting on a two or three year cycle. The cost involved in this type of operation is beyond the budget of most NPS sites. The use of historical techniques should, therefore, be evaluated according to site-specific management goals and operating funds available.

D. Wildlife Impacts

Agricultural uses often result in the creation and/or maintenance of open fields and edge habitat. The increase in edge habitat can affect many wildlife species. The possible impacts, both positive and negative, of creating and/or maintaining edge habitat, should be thoroughly considered and documented in any agricultural use decision.

E. Cultural Practices

Cultural practices should be reviewed along with their impacts during any consideration of agricultural uses. No-till farming, for example, may help protect erodible soils but usually requires more intensive pesticide use.

F. Crop Selection

Crop selection should be consistent not only with needs identified in the Cultural Landscape Report but also with maintenance of a sound environment. For example, the corn field at Antietam is integral to the historic events that occurred there. However, the specific variety of corn grown may not be critical. Similarly, nonhistoric crops may be appropriate (e.g., soybeans or short-grass meadow where the need is only to maintain open fields). Likewise, the crop selected

can affect other considerations such as management of nuisance wildlife or pesticide use (e.g., corn and soybeans usually require more pesticides than hay, or grazing, which might require none).

A further consideration in crop selection is genetic variety. Many historic varieties have been discarded over time because of disease or pest problems. Consequently, many antique varieties have limited use. However, because historic landscape standards should support the perpetuation of historic species rather than replacement with modern species, where historic varieties still occur in a park, they should be retained. These historic cultivars may be significant relics of human history, even if they are of "limited use." In cases where historic varieties no longer exist, in orchard trees for example, it may be possible to find historic varieties grafted onto modern rootstock, which thereby increases the probability of success and longevity of the plant.

Similarly, the selection of livestock should receive thorough consideration. Generally, a historically correct breed or one closely similar should be used if available. For instance, there is no reason to use a modern Holstein when a Shorthorn would be historically correct.

A special consideration in the selection of historical varieties of livestock is to choose the most pest-resistant type available.

G. Conservation Practices

As in the no-till example above, conservation practice factors and impacts should be thoroughly considered when planning agricultural uses. Practices which, for instance, improve soil and control unwanted plants should be fostered. Consideration should be given to such things as: rotation of crops, or of fields, for grazing; seasonal variation in animal units per month which an area can support; soil pH; fertilization; impacts on soil and equipment impact on cultural resources; and ground and surface water runoff, siltation, and pesticides.

H. Disease Control

Successful disease control relies on advance planning and implementation of cultural and mechanical activities, rather than simply on remedial actions involving pesticides and other chemical solutions. One example is the use of proper sanitation techniques associated with pruning trees and removing diseased and infested wood. The proper sanitation techniques can sometimes result in removal of potential infection sites from the agricultural environment. Another preventive method is the use of nutritional and cultural techniques to increase the health and vigor of the subject plant or animal species is likely to increase the resistance of the subject species to disease.

I. Succession and Diversity

Some agricultural uses, for example woodlots, may require consideration of allowing plant succession versus an arrested vignette. Likewise, the effects and associated impacts of perpetuating, or developing, a virtual monoculture (e.g., in a maple "sugar bush" woodland) should be considered.

J. Harvesting and Disposal

Agricultural uses, almost by definition, will result in some type of harvesting and subsequent disposal of the crop. While community and employee gardens, or field crops managed under a Special Use Permit with a local farmer, do not usually present a problem, the disposal of crops as varied as eggs from chickens at a living history farm to firewood resulting from a thinning cut of a woodlot should be considered as a part of decision-making about the appropriateness of an agricultural use. Some of these disposal questions are addressed in existing policies or directives. See, for example, Special Directive 82-6 on dead and down wood and property management regulations concerning disposal of surplus property.

K. Hazards

Inherent in agricultural uses are many and varied hazards. These range from tree hazards in woodlots and orchards to hazards associated with use of agricultural machinery or pesticides and the handling of livestock. The need to provide a safe environment for visitors and a safe workplace for employees, as well as potential tort liability, should be considered in any decision about the appropriateness of an agricultural use.

L. Wetlands and Other Sensitive Areas

Agricultural activities should not impinge upon wetland protection. Reference should be made to Soil Conservation Service soils maps, the Fish and Wildlife Service or the Army Corps of Engineers' wetlands maps, and other references to help identify wetlands. Agriculture should also be excluded from habitat of threatened or endangered species, and other sensitive areas. Although it might achieve landscape management objectives in the short run, such disruption could result in long-term impacts that are inconsistent with NPS mandates. In this Guideline, see Chapter 2, Freshwater Resources Management (Wetland Management).

M. Exotic Plants

Agricultural activities, particularly gardening, provide the opportunity for introduction of exotic plants into park systems. While crop species are generally not noxious, tilled soil can provide habitat for invading exotic species such as knapweed and thistle. Community and employee gardens should be screened for non-noxious cultivars and annual ornamental flowers that can spread into natural zones.

N. Fertilizers

Modern agriculture often relies heavily on chemical fertilizers to maximize production. This use may be inconsistent with NPS objectives and is generally unnecessary to preserve an historic scene. Historic practices, especially when more in keeping with NPS objectives, should be detailed in management plans. Fertilizer/pesticide mixes may not be used without approval through the pesticide use approval process.

III. Implementation of Agricultural Uses

Agricultural uses occurring in parks are implemented by three means: special use permits, leasing agreements, and NPS operations. Because agricultural activity occurring under either of the first two means can result in economic returns to the permittee, the Service should ensure that all interested parties are informed when permits are available and given the opportunity to apply for permits. The park should publish a formal notice in local newspapers and extension agents' newsletters, provide a formal application procedure, publicize the selection criteria, and document the decision process.

A. Special Use Permits

Special use permits, issued in accordance with the policy established by NPS-53, the Special Park Uses guideline, are perhaps the most frequently used method of implementing agricultural uses. NPS-53 should be consulted for further guidance concerning special use permits for agricultural uses.

B. Leasing Agreements

Agricultural uses accomplished through a lease must be in compliance with the provisions of 16 USC 460 l-22(a) (see also 36 CFR 17) or, for leases involving historic properties, in accordance with 16 USC 470, Section 111 (see also 36 CFR 18). When an agricultural use of an area is, in and of itself, an "interpretive exhibit," an agricultural lease may be appropriate. In these cases, the provisions of 16 USC 1(a)(2)(g) could apply. In all of these instances, any agricultural lease should have an Agricultural Use Guide which clearly and specifically sets forth the responsibilities of the lessee and the Service.

C. NPS Operations

The third method of implementing agricultural uses is by direct or indirect NPS operations. Directly, the NPS may use an area agriculturally, as in living history farms. The park may contract for agricultural activities. If farmers are uninterested in conducting agricultural operations for economic or other reasons, park personnel may carry out agricultural activities. Indirectly, the NPS may participate in agricultural uses through gardening at park-owned employee residences.

ROLES AND RESPONSIBILITIES

I. Park

Superintendents and their staffs, in concert with park planning teams, are responsible for planning agricultural uses. Superintendents also review and revise management objectives and have the ultimate responsibility for proper implementation of agricultural uses.

Cultural resource managers and **natural resource managers**, working with **interpreters**, establish goals based on the objectives identified by superintendents, develop action plans which identify strategies to accomplish these goals, and develop specific methods and techniques to implement the strategies identified.

Rangers, interpreters, and **maintenance personnel** apply and implement methods and techniques to accomplish goals and objectives.

Facility managers and **administrative officers** review the work of cultural and natural resource managers and interpreters for practicality (e.g., construction problems, future maintenance "headaches," contracting requirements, personnel rules).

II. Region and Washington Office

Regional office, Denver Service Center, and **Washington Office** personnel provide staff support through review of plans, establishing standards, giving or obtaining professional consultation when required, coordinating research, seeking funding, on-site program reviews, setting lease fees and other assistance.

REFERENCES

Firth, Ian J.W. 1985. Biotic cultural resources: Management considerations for historic districts in the national park system, Southeast Region. NPS Research/Resources Management Report SER-82.

Melinck, Robert. 1984. Cultural landscapes: Rural historic districts in the national park system. U.S. Govt. Printing Office, Washington, D.C.

RIGHTS-OF-WAY AND EASEMENTS

Rights-of-way and easements represent tools for managing and controlling access to, use of, and interest in land so as to best preserve park resources. In general, rights-of-way are granted by the NPS, while easements are acquired. In either case, it is the responsibility of the superintendent to see that these interests are granted or acquired in a way that will not cause the derogation of the values and purposes for which the park was established. The park resource manager serves as key staff support to the superintendent in evaluating rights-of-way and easement proposals with regard to their potential impacts on park resources and values. The resource manager should recommend terms, conditions, and mitigation measures to be incorporated in these proposals in order to better protect park resources. The resource manager should also carefully monitor all existing rights-of-way and easements and report existing or potential resource impacts to the superintendent.

Detailed guidance on administration of rights-of-way within parks is provided in NPS-53, the Special Park Uses guideline. Detailed guidance on use of easements is provided in NPS-53 and in NPS-2, the Planning Process guideline.

Each regional office has a designated rights-of-way coordinator to provide oversight and guidance on the issuance of rights-of-way. The Ranger Activities Division under the Associate Director, Operations, provides overall guidance on rights-of-way and coordinates the review of rights-of-way for approval by the Director. Only the Director has approval authority for rights-of-way.

REFERENCES

Diehl, J. and T.S. Barrett. 1988. Trust for Public Land and Land Trust Exchange.

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BACKCOUNTRY RECREATION MANAGEMENT

Over half of the NPS units include large undeveloped areas which provide opportunities for backcountry recreational activities. In fact, a number of NPS areas were established primarily for the recreational opportunities they offer. Types of backcountry recreational activities that may be allowed include, but are not limited to, boating, camping, day hiking, overnight camping, horseback riding and pack stock use, picnicking, scuba diving, cross-country skiing, caving, hunting, mountain and rock climbing, snowmobiling, off-road vehicle use, bicycling, and swimming.

DEFINITIONS

Backcountry As used by the NPS, this term refers generically to "primitive, undeveloped portions of parks" (Management Policies 8:3). While backcountry areas are most often zoned as natural zones, backcountry areas may occur in any land classification zone, except the developed zone. Any area designated or determined eligible for wilderness designation is considered to be backcountry. Developments within backcountry areas are generally limited to trails, unpaved roads, and administrative facilities associated with dispersed recreational use. Dispersed recreational use is the most prevalent human use in backcountry areas.

POLICY AND PROGRAM OBJECTIVES

NPS policy recognizes that providing for visitor recreational use has been a fundamental purpose of NPS areas since the establishment of Yellowstone National Park in 1872. The NPS Management Policies states:

> The National Park Service will encourage recreational activities that are consistent with applicable legislation [and] that promote visitor enjoyment of park resources through a direct association or relation to those resources. (8:2)

Most of the recreational use in parks occurs in developed areas (e.g., along road corridors, day use areas, campgrounds). In the management of recreational activities, the NPS is guided by the following objectives:

1. protection of both natural and cultural park resources and natural processes, including prohibition of consumptive uses of park resources except where authorized by law or regulation,

2. protection of unique or important backcountry recreational opportunities by avoiding inadvertent changes in the recreational experience,

3. provision of a varied spectrum of backcountry recreational uses as appropriate in the diverse NPS areas, and

4. avoidance of unacceptable levels of danger to the welfare and safety of the public, including recreational participants.

Limitations imposed on recreational uses should be the minimum necessary required to achieve these objectives. Where practicable, any restrictions should be based on the results of research. Appropriate tools for managing recreational activities may include plans for backcountry, river, cave, and other recreational uses; general or special regulations; permit and reservations systems; and local restrictions implemented under the discretionary authority of the superintendent. "The Park Service will seek consistency in recreation management policies and procedures on both a servicewide and interagency basis to the extent practicable." (Management Policies 8:2) Because of extensive variation in both the physical environment and nature of recreational use across the National Park System, it is not envisioned that a single set of resource impact standards or use level standards can be established. Each superintendent should develop standards based on research and input received through the planning process. These standards should have some relevancy to other parks with similar conditions. "The National Park Service will identify acceptable limits of impacts, monitor backcountry use levels and resource conditions, and take prompt corrective action when unacceptable action when unacceptable impacts occur." (Management Policies 8:3)

AUTHORITIES

In addition to the general authorities discussed in Chapter 1, backcountry management is affected by the National Environmental Policy Act (NEPA), the Wilderness Act, the Wild and Scenic Rivers Act, the Federal Cave Resources Protection Act, the Alaska National Interest Lands Conservation Act, Executive Order 11644 "Use of Off Road Vehicles on the Public Lands," the National Historic Preservation Act, and park-specific enabling legislation.

A number of sections of the NPS general regulations (36 CFR Parts 1-5 and 13) relate to backcountry recreational use management. Parts 2, 3, and 13 of the regulations are particularly relevant. General regulations addressing aircraft use, off-road bicycling, hang-gliding, off-road vehicle use, and snowmobiling require that special regulations be developed before these uses may be authorized in a park. (Special provisions pertaining to some of these activities in Alaskan parks are codified in 36 CFR Part 13.) Any recreational activity may be further regulated by restrictions imposed under the superintendent's discretionary authority (36 CFR 1.5) and by special regulations (36 CFR 7 and 13).

RELATIONSHIP TO OTHER GUIDANCE

Policies and guidelines which relate directly to management of backcountry recreational use are numerous. The portions of NPS Management Policies which are most relevant include sections of Chapter 8 regarding visitor use and all of Chapter 6, covering wilderness management. Specific NPS guidelines which are relevant include NPS-4, the Diving Management guideline; NPS-53, the Special Park Uses guideline; NPS-12, the Environmental Compliance guideline; and NPS-2, the

Planning Process guideline. The NPS Trails Management Handbook, 1983, provides guidance on maintenance and construction of trails. In this Guideline, see especially Chapter 3, Grazing, Hunting and Trapping, and Fishing; and Chapter 4, Special Park Designations and Environmental Compliance.

PROGRAM GUIDANCE

I. Backcountry Recreational Use Planning

A. General Guidance

Each area with a sufficient level of backcountry recreational use must develop the necessary backcountry recreational use management plans. Several options exist for completing these plans. The plan can be a component of the park general management or resource management plan; it can be a single integrated plan which addresses a broad spectrum of recreational activities, such as a park backcountry management plan, which discusses all backcountry recreational uses; or it can be an activity-specific document such as a river use management plan, a cave use management plan, etc.

For most parks with significant levels of backcountry recreational use, the relatively brief discussion contained in general management or resource management plans will not be adequate. These parks will require the preparation of broad spectrum and/or activity-specific plans. The scope of these plans will vary from park to park. In some parks, a single plan may be adequate to address all types of backcountry visitor use; in other parks, activity-specific plans may be required; and some parks may have both broad spectrum and activity-specific plans. Specific types of backcountry recreational use plans most often prepared are trail stock use, cave use, river use, backcountry use, and off-road vehicle plans for beach use.

By definition, any recreational use will result in some level, perhaps unmeasurable, of impact. Therefore, the backcountry planning process is not so much a process of determining how to prevent any human-induced change as one of deciding how much change will be allowed to occur. Determining appropriate use levels is a technical procedure only in limited cases, such as protecting endangered species or National Register of Historic Places properties, where resource protection goals are absolute. In other cases, integration of research data, management constraints, and citizens' interests must be combined to achieve a successful plan. One widely accepted method for accomplishing this is the limits of acceptable change model developed by the U.S. Forest Service.

In the development of backcountry recreational use plans, it is critical that the plan focus on the visitor use as opposed to focusing on developments being considered to facilitate that use. While it may be true that the actual developments cause the greatest environmental impact, it is critical to remember that developments are only constructed in support of the recreational use and are not

the final goal of the planning effort. It would be inappropriate, for example, to complete a trail development plan for an area without first completing a visitor use plan for that same area.

While plans are necessary for proper management of backcountry use in many situations, restrictions contained in these plans should be the minimum necessary. Any restrictions on use should directly relate to the accomplishment of specific management objectives identified in the plan, or resolve specific, documented impacts. Where restrictions are imposed, they should be implemented on a graduated scale from indirect controls such as public education and trail relocation to direct controls such as use limitations and area closures.

A wide range of preferences for recreation use opportunities exists among NPS visitors. The wide diversity of resource opportunities and settings found in parks provides the opportunity for a broad segment of the public to pursue the particular recreational experiences they are seeking. These recreation use opportunities are defined by various physical, biological, managerial, and social conditions. Each of these conditions can be best characterized as a continuum. For example, access can range from paved highway access to remote trailless areas. High quality recreation experiences can be derived at any point along this continuum, depending on the values of the recreationists. Superintendents should develop an understanding of the various conditions, both existing and desired, and ensure that actions taken preserve desired recreational opportunities and avoid unacceptable impacts on visitor expectations.

One common technique for preserving this diversity of high quality experiences is the stratification of use levels through zoning. In developing backcountry use management plans, zoning has proven useful as a means of achieving management objectives and providing different experiences for satisfying various user demands. Managers may want to establish different recreational use zones ranging from areas with high concentrations of use to pristine areas with very little use. This management concept has broad applicability from management of boating to off-road vehicle use to river use.

Persons assigned responsibilities for preparation of backcountry recreational use plans should have both educational and practical experience in managing visitor recreational use. In addition, depending on plan complexity, expertise in the following areas may be needed: natural resource management, planning, environmental compliance, cultural resource management, law enforcement, interpretation, maintenance, and concessions management. Most plans will be completed at the park level with input from the regional office. On unusually complex plans, assistance of the Denver Service Center should be considered.

Public participation is essential for the development of a successful plan. The amount of public involvement will have to be determined on a plan-by-plan basis. Key publics to be involved besides the particular recreational user or special interest groups affected include adjacent landowners/managers, persons engaged in other recreational activities which could conflict with activities being considered (e.g., hikers should be involved in the development of a stock use plan), concessioners, conservation organizations, local communities, and park support groups. The most

important times during the planning process to seek public input are at the beginning of the planning process, in the scoping of issues and development of management objectives, and in the review of the draft plan/compliance document. Information to be sought from the recreational users includes identification of unique aspects of the recreational experience; facility needs; user expectations, motivations, and satisfactions; and threshold values for specific resource impact values and social parameters which could be used in the development of specific management objectives.

All backcountry recreational use management plans are public documents developed through a sequential planning process. Compliance with the NEPA through preparation of an environmental assessment or an environmental impact statement, depending on the level of impact associated with the proposed action, is required on all plans. Since a major purpose of the compliance document is to assist in the decision-making process by analyzing alternative actions, it must be prepared prior to the final plan except under special circumstances. The compliance document can be either a separate document or integrated with the draft plan. Copies of all final plans should be sent to the Technical Information Center at the Denver Service Center for accessioning into NPS records.

B. Specific Plan Requirements

The following 11 topics should be addressed in all visitor backcountry recreational use planning efforts. However, these documents may summarize more extensive discussions contained in the environmental compliance document.

1. Previous Planning History

The status of previous plans applicable to this effort should be discussed. This section should outline key changes proposed in any previous plans. The strengths and weaknesses of previous plans should also be outlined, as should the reasons for initiating a new planning effort.

2. Authorities

The plan should reference the relevant authorities, including a brief discussion of all laws of general applicability and more detailed discussions of directly relevant and park-specific laws. The detailed discussions should consider relevant legislative history, including House and Senate reports and statements made by sponsoring legislators. NPS management policies must be reviewed and referenced as applicable, as should any appropriate guidelines and regulations.

3. Critical Resources

The plan must identify any critical resources which could be impacted by visitor recreational activities or associated developments. This should include natural and cultural resources as well as important aspects of the visitor use experience. The plan must discuss the current condition of those resources and whether or not mitigation is currently needed to achieve management objectives. Prior to approval of the plan, adequate information on critical resources must be

developed to determine the likelihood of potential impact. Surveys for endangered species and associated critical habitat and archeological resources must precede implementation of any actions with possible adverse effects.

4. Visitor Use Analysis

The plan must discuss trends in visitor use activity levels and should discuss any changes over time of the visitor experience. The plan should include both historical data and projections of future visitation. Future visitation projections should be based on past local experience, regional and national trends regarding the particular recreational activity, and demographic projections based on the visitor profile, and should include identification of factors influencing visitation and the appropriate level of impact the factors have on visitation.

The plan should also provide a sociological profile of the recreational visitors. The expectations and satisfaction of recreational users should be identified along with any existing concerns regarding the recreational experience. It is not envisioned that exhaustive sociological surveys will be required to develop this profile, but where they are required, approval from the Office of Management and Budget must be sought.

5. Regional/National Context

The plan must identify how the particular activity relates to other recreational opportunities either locally or nationally. Is this an activity for which there are abundant other opportunities to participate locally or is this an activity with unique qualities which need to be preserved? Where appropriate, interagency planning and management strategies will be pursued as part of this planning process to provide continuity to the visitor experience.

6. Existing Facilities

The plan should identify all existing facilities in the backcountry. These facilities should be described verbally as well as presented on a map. Where feasible, this should include the location of all trails as well as any physical developments. The current uses of these facilities should also be outlined.

7. Specific Management Objectives

The specific management objectives should be described and linked to critical resources identified through the park's resource inventory program or through the public involvement process on the plan. These objectives should be specific enough to enable the park to measure them.

One of the most important management objectives that needs to be developed for each plan relates to the determination of appropriate use levels. The objectives should outline how much resource degradation will be acceptable to park management. Research findings in the fields of physical,

biological, and social science can be used as guides for determining the importance of various impact levels. However, managers will usually need to consider public input and management considerations such as cost, personnel requirements, and logistics before arriving at final use level determinations.

8. Action Plan

This is the heart of the plan. It contains the prescription by which the park will achieve the management objectives. The action plan must identify the range of remedial actions to be undertaken if the management objectives are not being achieved. The action plan should also contain an identification of any facilities which are necessary to support the recreational activities or other park management needs. The type and number of facilities should be limited to the minimum necessary to achieve a park's backcountry management objectives. Maintenance considerations (e.g., life cycle costs, accessibility, technology requirements) for all backcountry facilities must be fully analyzed. Construction materials used should harmonize with the park environment. Program responsibilities and funding requirements for carrying out the plan's provisions should be identified. This section of the plan should also discuss administrative actions that will occur in the backcountry, such as aircraft use and research projects. Timing for implementing the various actions outlined in the plan should be identified. Public education efforts should be discussed.

9. Commercial/Concessioner Activity

Based on the management objectives developed and public input, a determination should be made as to whether a concession operation is required. The plan should contain a written analysis of whether a concession operation is necessary and appropriate.

10. Monitoring Program

The plan must outline a monitoring program which will be used to determine whether the management objectives are being achieved. The monitoring program must be capable of identifying specific mitigation actions directed at specific locations, periods of time, and types and amount of visitor use. The plan should identify the offices responsible for implementation of monitoring.

11. Plan Review and Update

The plan must identify the procedures for updating. This should include the frequency of plan review, or identification of the conditions which would require a plan review. Unless conditions are particularly constant, the life of recreational visitor use plans should not exceed 10 years. Most plans will need to be reviewed in depth at a three to five year interval. The necessity for additional compliance under the NEPA should be addressed in all plan revisions.

C. Special Types of Plans

1. Wilderness Management Plan

Each park with designated wilderness is required by NPS Management Policies to develop a wilderness management plan. This plan will preferably be an integrated plan which addresses all visitor recreational uses (e.g., hiking, stock use, caving, river use) and other ongoing or projected activities in the wilderness area. All wilderness plans must be reviewed and approved by both the regional and Washington Offices in order to ensure nationwide consistency.

A separate wilderness plan is not required for areas where the Administration is recommending wilderness or where wilderness designation is pending in Congress. In those situations, the recommendation itself provides the basic management direction. In accord with NPS policies, parks must not implement actions or programs that are inconsistent with that recommendation until Congress has made a final determination.

The central objective of every wilderness plan should be ensuring perpetuation or restoration of the wilderness character of the area. Designated wilderness requires higher standards for protection of the visitor experience than would normally be found in backcountry plans for park areas managed as natural zones. Therefore, upon wilderness designation, each park must review its current backcountry visitor management plans and make a determination as to whether those plans provide for "outstanding opportunities for solitude" as well as the other legal requirements of the Wilderness Act and park-specific wilderness designation. Recreational activities to be emphasized in wilderness should be those that depend to a significant degree on wilderness settings or conditions. Where recreational use conflicts occur, uses that depend most on wilderness should be favored. Management activities should strongly favor preservation of wilderness values over other potential uses.

a. Motorized Equipment Use

One of the important issues which needs to be addressed in all wilderness management plans is the administrative use of motorized equipment. While limited use of this equipment may be allowed when justified in wilderness, this does not imply that such use is compatible with wilderness values. Use of motorized equipment must be discussed in detail in a programmatic fashion in the plan or in a subsequent written request to the superintendent or Regional Director. Written approval for use of equipment can be provided on either a project or program basis. For example, chain saw use for a specific type of trail maintenance during certain time periods would need to be approved only once.

Motorized equipment and aircraft may be used for an emergency situation involving human health or safety or protection of wilderness values without going through the approval process, but a contingency plan for this should be outlined in the wilderness plan itself. Any administrative use of aircraft over wilderness below 2000 feet above ground level must be approved in writing by the

superintendent (unless it is specifically contained in the park's general management plan or wilderness management plan or authorized by law).

An exception to this policy occurs in Alaska: motorized equipment use is permitted in Alaska in all designated wilderness areas, subject to appropriate regulation, for all traditional activities and for travel to and from villages and homesites. This includes snowmachines, motorboats, and airplanes. For further information on the specifics of use of motorized vehicles in Alaska, refer to the Alaska Native Interest Lands Conservation Act of 1980 and special Alaska park provisions in 36 CFR 13. For park-specific information, consult the general management plan.

Each written request to the superintendent for the use of motorized equipment in wilderness must be accompanied with an analysis which includes an outline of the project, options for completing the project, and description of the preferred option and mitigation actions. The discussion of the project should include a clear statement of the nature and quantity of work to be done. It should also outline whether the project relates to the wilderness management plan and management objectives for the area. A discussion of compliance with the NEPA and other environmental laws should be included.

The range of alternatives discussed should include as a minimum:

1. the no action alternative, or what will happen if the project is not implemented,

2. implementing the project without motorized equipment,

3. use of the minimum amount of motorized equipment, and

4. the preferred action (if different from alternative 3).

The comparison of alternatives should discuss environmental, social, and management impacts (e.g., costs and personnel requirements) of the alternatives as well as the relationship of the proposal to adjacent land uses. Note that economic considerations alone will not be adequate to justify use of motorized equipment. The discussion of the preferred option should include all appropriate mitigation actions.

2. Cave Use Management Plan

Caves often contain cultural, paleontological, biological, and/or geological resources which are essentially nonrenewable. In recognition of this, cave use management plans for areas with numerous cave resources or particularly outstanding cave resources should consider a full range of use levels. These use levels should range from caves which are open to all human use without permit to caves which are closed to all use including management and research use. See also, Chapter 2, Cave Resources Management.

3. Stock Use Management Plan

Discussed in Chapter 3, Grazing.

II. Management Issues and Strategies

Management of backcountry recreational use programs often requires intervention by superintendents to address problem issues and concerns. As a general rule, and depending on the severity of environmental impacts, the level of management intervention exerted in addressing these issues should be on a graduated scale from indirect to direct methods.

Indirect methods to be applied include providing information and education to visitors about other recreational opportunities or impact limiting techniques, rehabilitation of impacted sites, trail delineation or improvement, signing, rerouting of primary transportation corridors away from major destinations in combination with establishment of spur trails to attraction sites, and strategic location and design of developments (e.g., number of parking spaces, additional trail construction, road improvements, designation of campsites).

Management techniques which provide for direct control of recreational use are usually based on some type of rationing or limitation. The most common forms of rationing include limits on types of recreational use, numbers of users, party size, activities such as campfires and use of mechanized equipment, timing of use, and location of use. Backcountry use permits are generally required in order to implement use limitation plans. However, these permits should only be used when limits on use are needed to prevent specific impacts and after indirect control methods have failed; to assist the visitor in pre-planning a trip; for providing critical safety information regarding climatic, geologic, wildlife, disease vectors, or other hazards; or for limited periods of time to gather basic visitor use data. These permits should not be required for the general purpose of controlling visitor use.

The six most common backcountry management issues are trail deterioration, campsite deterioration, littering, crowding and visitor conflict, human waste, and wildlife impacts. Deterioration of trails and deterioration of campsites are the most common and widespread impacts in backcountry settings. Each of the six management issues is discussed in detail below, along with various management techniques appropriate for addressing them.

A. Trail Management

The majority of environmental impacts from recreational trails results from inappropriate trail construction and maintenance. Thorough site analysis, careful planning and design, and thoughtful maintenance and monitoring, guided by the concept of sustainability, will benefit backcountry resources while affording a reasonable standard of safety and comfort for the traveler.

1. Sustainability

Sustainability of backcountry trail corridors is defined as the ability of the travel surface to support current and anticipated appropriate uses with minimal impact to the adjoining natural systems and cultural resources. Sustainable trails have negligible soil loss or movement and allow the naturally occurring plant systems to inhabit the area, while allowing for the occasional pruning and removal of plants necessary to build and maintain the trail. If well built, a sustainable trail minimizes seasonal muddiness and erosion. It should not normally affect natural fauna adversely nor require re-routing and major maintenance over long periods of time.

2. Planning

One key to ensuring long-term trail sustainability is identifying new and rebuilt trails projects in relevant planning documents such as a general management plan (GMP), a development concept plan (DCP), and/or an interpretive prospectus (IP). This ensures the involvement of an interdisciplinary planning team. Each project should include information on site topography, soils, visitor trip origins and destinations, design guidelines, and anticipated maintenance strategies. Backcountry management plans should be coordinated with related plans, such as sign plans. Good planning can avoid problems such as steep grades and erosion, which destroy sustainability.

Factors which must be considered to achieve trail sustainability include soil types, the grades of the trail profile relative to existing cross-slopes, surface moisture and drainage, solar aspect, exposure, types and seasons of use, use volumes, desired design and maintenance standards, ecological implications for trailside vegetation, and functional and aesthetic control points (trailheads, scenic views, lakes, etc.). Planners should develop sustainability criteria tailored for each trail project which provide a reference point from which the achievement of future accomplishments can be measured.

3. Design and Construction

Experience in trail design, construction, and management is essential for implementing projects that involve poor soils, complex topography, high levels of use (especially when stock animals are involved), and extensive improvements, such as surfacing or structures. Experience is also essential to design multiple use trail corridors to meet standards which allow safe use of the trail.

Two of the most common problems of backcountry trails--deterioration through overuse of popular trails and the development of undesired routes at popular destinations--can be avoided by drawing on personnel with trail design and management experience and by following commonly accepted standards of trail design after thorough field study. Observing proposed or existing routes through several seasons, including winter, will assist the planning team in determining the fitness of new corridors for trail development, as well as the level of improvement or rerouting required to achieve sustainability for rebuilt trails.

Design guidelines can aid in decision-making on specific trail locations at different levels of improvement. A simple outline, with supporting sketch plans and views is usually sufficient to describe the desired criteria, trail segments, trail destinations, nodes, natural and cultural resource points of interest, design intentions, design and construction standards, and the anticipated investment in improvements.

There are a variety of factors necessary for a sustainable, low-impact trail. For example, sidehill trail design is the surest way to prevent erosion. Cross-slopes for backcountry trails should range between 10% and 70%. The maximum grade for natural-surface trail is about 12%. By carefully fitting the trail profile to the local topography, erosion will be minimized, thus increasing the durability and sustainability of the natural surfaces.

The grades of sustainable trail surfaces are almost always less than 15% and should be less than 1/4 the prevailing adjoining cross-slope. The maximum grade of a length of a trail should also vary, since steeper topography is able to sustain steeper trail grades. This relationship suggests 5% grades in 20% cross-slope areas, 10% in 40%, and 12% maximum profile grades in 48% or more cross-slopes. Trails with grades greater than 15% are especially prone to erosion. Where trail relocation to areas with grades less than 15% in good soils is not possible, surfacing or structures may be required. Natural surface trails where the cross-slope is less than 10% usually require surfacing, such as corduroy or gravel, and drainage improvements, such as ditches, culverts, and French drains, if they receive even a moderate amount of use. Natural-surface trails in cross-slope areas between 70% and 90% usually require retaining walls to hold them in place. Where cross-slopes exceed 90% it is usually not possible to build natural surface trails.

4. New Uses on Existing Trails

When new uses (e.g., mountain bikes on hiking trails) are being considered for existing trails (many of which evolved through use and not design), planning teams must carefully consider sustainability factors. The design principles used for old roads and railway beds are significantly different from those used for trails, so it is necessary to evaluate sustainability factors when redeveloping these types of corridors for new uses. In addition, the evaluation of other trail projects in the local area can assist in developing sustainability criteria for the current project.

5. Maintenance and Monitoring

Some degree of maintenance is required to perpetuate a trail's intended dimensions and integrity. This often occurs at the beginning and end of each use season, as well as in response to emergencies. On some trails, routine activities may be required each month during peak use. Long-term maintenance should be part of the planning and design considerations. Typically, trails require about 10% of the original time and dollar investment each year after construction in routine maintenance. Much of this work can be carried out by volunteers. Monitoring and updating maintenance schedules each season and year ensures continued sustainability.

In addition, monitoring various use factors over time such as access, patterns, and intensity is important to ensure ongoing sustainability. Consistent multi-year record keeping is important to ascertain trends. The type and amount of use on a particular trail, along with that trail's ability to support changing patterns of use, will influence the type and complexity of the monitoring program.

Using photographs to monitor trail use at access points and high-use locations can be effective in recording changes to the natural environment, especially vegetation. Transects can be used to monitor changes to soils. Effective trail monitoring will help pinpoint specific use and resource problems early and thereby suggest modest improvements or management actions in lieu of more intensive and intrusive remedial measures at a later date.

Undesired trails develop when use cannot be sufficiently limited to existing trails. Undesired trails most commonly develop close to managed trails, along switchbacks, and in wet meadows. Away from managed trails, undesired trails develop along frequently used cross-country routes and in popular destination areas as multiple trail braiding. Management techniques available for resolving this problem include keeping visitors on the managed trails by locating and delineating them properly or by enforcement, proper timing of visitor use, education on wilderness ethics, and limiting overall use patterns.

B. Campsite Management

Similar to trail deterioration, the problems with campsite deterioration involve both deterioration of desired campsites and development by campers of more sites than are desired or needed.

The most pronounced ongoing impact at established sites is enlargement, caused by spreading out to adjacent undisturbed or lightly disturbed areas. The most important influences on the amount of deterioration on established sites are the types, amount, and season of use; substrate durability; visitor behavior; and where they camp. Management tactics which should be employed to address this problem include restricting camping to certain categories of users based on number in party or by limiting stock use, location of designated campsites in durable areas, limits on camping duration, campsite rotation, restricting camping to designated sites, hardening of campsites, prohibition of campfires, encouraging dispersed use combined with education on minimum impact camping techniques (in low use areas only), and prohibition of damaging practices or equipment.

The primary cause of campsite proliferation is overuse of destination areas where use is not confined to a relatively small number of sites. The most important influences on site proliferation are where and how people camp. The primary options for resolving this issue in heavily used areas require restricting use to previously impacted sites, designation of sites, or limiting overall use. In lightly used areas, impact mitigation can be achieved by dispersing camping to previously undisturbed sites along with an education program on low-impact camping techniques.

C. Litter Management

Litter has been identified in a number of studies as a significant source of impact on the backcountry experience. Certain activities, such as bait fishing, are highly correlated with increased litter. Litter is one of the easiest backcountry problems to resolve. Continual reinforcement of the pack-it-in, pack-it-out philosophy has already resulted in reduction of backcountry littering. Careful management of activities associated with litter, visitor education, maintenance of a litter-free environment by park personnel, and enforcement are the primary techniques for resolving this issue.

D. Crowding and Visitor Conflict Management

Research provides evidence that the perception of crowding is a function of more than how many other parties are encountered: the location of the encounter is important, with encounters at campsites being less acceptable than encounters enroute, and encounters at a long distance from developed areas being more objectionable than contacts at access points. Crowding is also affected by the type and behavior of party encountered: encounters with larger parties or parties pursuing different recreational activities are less acceptable than encounters between parties possessing similar characteristics. Visitor expectations also have an effect on the extent to which the number and type of encounters contribute to crowding.

Crowding occurs where there are simply too many people in the same place at the same time. This situation is influenced not only by the absolute number of users, but also by the timing and destination of visits. The primary methods for addressing crowding include advising visitors of alternative opportunities or discouraging use during crowded periods; limiting numbers of users, party size, or length of stay; designation of campsites; controlling development of access routes or facilities, and encouraging behavior which will limit the number of contacts. While dispersal of visitor use is an important management tool for addressing crowding, decisions to disperse use should be made carefully and only after a thorough analysis of the potential effects. Dispersal of recreational use often results in increased impacts in more pristine areas or areas containing sensitive resources. Baseline data and monitoring programs should be used to measure the impacts of a dispersal strategy.

The level of visitor conflict is influenced by the same factors that influence the level of crowding: location of encounter, recreational use and behavior of the other party, and visitor expectations. Conflict can be especially severe if the use or behavior of the other party is considered inappropriate. The primary tactics for dealing with visitor conflict are segregation of different types of users, elimination of conflicting uses, educating visitors about potentially conflicting uses in the area, and educating parties on how to reduce conflict.

E. Human Waste Management

Human waste usually becomes a problem where use is relatively high or where options for placement of waste are restricted. Where use is heavy, reduction in visitor use through overall use

limitations, length of stay limits, designation of campsites away from water bodies, or restriction of areas to day use only may be necessary. Where locations for waste disposal are particularly limited, such as along river corridors and technical climbing routes, the option of carrying out waste should be explored. If these techniques are unsuccessful, then regularly maintained toilet facilities may be required. Selection of the type of toilet facility to be installed must carefully consider such factors as soils, potential water source contamination, maintenance, and cost. Aerobic composting offers a mechanism for waste degradation/recycling which produces an organic product that can be used to improve impacted soil situations. Parks currently using systems utilizing aerobic composting include Chesapeake and Ohio Canal National Historical Park and Redwood National Park. The San Dimas Technological Center (USFS) is also involved in development of this technology. Note that installation of toilet facilities in wilderness is a last resort, to be implemented only after a thorough investigation of alternatives. The human waste problem may be partially mitigated by education of visitors on proper waste disposal methods.

F. Wildlife Impact Management

Destruction of wildlife habitat by human recreational use in backcountry settings can have an adverse effect, especially on smaller mammals. The primary habitat loss results from impacts on vegetation and soils along trails and at campsites. However, the wildlife impacts of greatest concern to park staff are wildlife disturbance and attraction and feeding.

Wildlife disturbance by visitors in backcountry settings includes both intentional and unintentional disturbance. These impacts can be serious when they occur during critical breeding, feeding, or times of the year when animals are weak or engaged in reproduction. The magnitude of impact can also be increased if recreational use areas coincide with important wildlife habitat. Primary techniques or strategies for addressing this concern are educating visitors about potential impacts of their behavior and restricting access in locations or during times which are critical for wildlife survival.

Attraction and feeding of wildlife can be a serious problem, especially in bear country. However, attraction of smaller mammals also leads to impacts on those animals, or to equipment damage and visitor injury. The primary techniques for addressing this concern are educating visitors on proper food storage and potential impacts of wildlife feeding, avoiding bear concentrations, and providing food poles or other food storage devices. (See also, Hazardous Animals, in Chapter 2, Public Health and Safety.)

ROLES AND RESPONSIBILITIES

I. Park

The **superintendent** has the primary responsibility for developing and implementing backcountry recreational use programs in a park. The superintendent should ensure that the programs implemented are consistent with all applicable laws and policies. The superintendent should initiate

the development of backcountry recreational use plans as necessary. The superintendent is responsible for assuring that adequate funding and technical expertise is available to prepare and implement visitor backcountry recreational use management programs. The superintendent should coordinate the visitor use management plans with neighboring land managers as appropriate. Each superintendent with designated or eligible wilderness should designate a wilderness coordinator to review all activities ongoing in the wilderness.

II. Region

The primary role of the regional office is to provide oversight and guidance to superintendents in carrying out their backcountry management programs. Since all visitor use management plans require either an environmental assessment or an environmental impact statement, the regional office becomes involved in the overall planning effort.

In addition to technical review of the compliance document, the regional office is responsible for policy level review of all plans. The regional office also provides consultation to parks in situations where the existing policies are not fully applicable or require interpretation. Regional offices are also responsible for development of consistent and comprehensive programs on a regionwide basis.

Regional offices should assure that adequate technical expertise is available to advise parks on visitor use management issues. Regional offices are also responsible for providing scientific expertise in environmental and social sciences to ensure that programs developed for implementation by parks are scientifically defensible. Each regional office should designate a wilderness coordinator to oversee the wilderness program within the region.

III. Washington Office

The Washington Office has overall responsibility for establishing and refining national policy. The Washington Office is responsible for development and approval of necessary guidelines for policy implementation. The Washington Office should strive for a well coordinated and consistent application of backcountry recreational use management programs among all park units. The Washington Office wilderness coordinator conducts reviews of all wilderness management plans. The Washington Office provides review of any other significant or technically difficult visitor use plans upon request by the regional offices. The Washington Office also provides leadership in information sharing designed to improve program consistency and quality. This will include sponsoring training activities and sharing research results on backcountry management issues of broad applicability.

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SUBSISTENCE AND OTHER TRADITIONAL USES

The traditional use of park lands and resources by Native Americans and others who have traditional ties to those park lands and resources is a significant activity in Alaska parks, and also occurs in other areas Servicewide. These uses are generally related to religious activities, or subsistence activities that include hunting, fishing, trapping, and foraging. This section provides general guidance on managing traditional practices that involve the consumptive use of park resources.

DEFINITIONS

Subsistence uses Defined for Alaska by the Alaska National Interest Lands Conservation Act (ANILCA) as the customary and traditional uses of wild, renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption; for barter, or sharing for personal or family consumption; and for customary trade.

Traditional groups These can include Hispanics, Afro-Americans, Caucasians, Asian Americans, and American Indians and other Native Americans with ancestral ties to the National Park System. In NPS Management Policies, Native Americans include American Indians (including Carib and Arawak), Eskimos, Aleuts, and native Hawaiians, Samoans, Chamorros, and Carolinians. American Indian tribes may be federally or state recognized, or be defined by themselves and known to others as members of a named cultural unit that historically has shared a set of linguistic, kinship, political, and other distinguishing cultural features. Eligibility of specific groups or individuals is set forth in the particular legislation and related regulations that provide for traditional uses.

POLICY AND PROGRAM OBJECTIVES

The NPS Management Policies states that:

> The National Park Service, to the extent consistent with each park's legislated purposes, will develop and execute its programs in a manner that reflects knowledge of and respect for the cultures, including religious and subsistence traditions, of native American tribes or groups with demonstrated ancestral ties to particular resources in parks. Evidence of such ties will be established through systematic archeological or ethnographic studies, including ethnographic oral history and ethnohistory studies, or a combination of these sources. (8:8,9)
>
> Subsistence uses and access will be allowed only where such activities are specifically mandated by federal law, such as the Alaska National Interest Lands Conservation Act, or treaty rights. Subsistence uses will be conducted in accordance with the provisions of law and consistent with sound management principles and managed so that the composition,

condition, and distribution of native plant and animal communities and ecosystem dynamics are not significantly altered. (8:16)

Certain contemporary native American and other communities may pursue customary uses of resources in parks with which they are traditionally associated. Such continuing use is often essential to the survival of family, community, or regional cultural systems. Recognizing that its resource protection mandate affects this human and cultural context of park resources, the Service will plan and execute programs in ways that safeguard cultural and natural resources while reflecting informed concern for the contemporary peoples and cultures traditionally associated with them. (5:11)

The objectives of managing subsistence and other traditional uses of park resources are to:

1. establish baseline data, including identification and inventory of resources which are traditionally used, and of traditional user groups; monitor the extent, frequency, and intensity of such uses and the effects of these uses on park resources; and monitor the effects of park plans and actions on these user groups.

2. assure that traditional use privileges authorized by law are protected to the extent required by law when resource management or other park management actions are taken.

3. assure the consistency of traditional use activities with conservation of natural ecosystems and natural and healthy populations, unless otherwise specified by law.

4. assure that each park with such traditional uses establishes close ties and communications with individuals or groups that participate in traditional use of the area's resources.

5. assure that the locations of culturally sensitive resources and the identities of community consultants are kept confidential.

AUTHORITIES

Numerous laws, Executive Orders, treaties, cooperative agreements, and NPS policies provide the authority for the consumptive use of park resources by traditional groups and define relationships between the NPS and these groups. In addition, many parks have enabling legislation that will affect the implementation of these guidelines and direct park management.

Some of the principal documents that have a direct effect on traditional uses of park resources are: American Indian Religious Freedom Act; Alaska National Interest Lands Conservation Act; Endangered Species Act of 1973; Bald and Golden Eagles Protection Act; Migratory Bird Treaty Act; the Marine Mammal Protection Act; the National Environmental Policy Act; 36 CFR 2.1 - 2.4 (resource protection, park uses); 36 CFR 13 Subparts B and C (resource protection, park uses

including subsistence--Alaska specific); 50 CFR 100 (federal subsistence management regulations for Alaska); 50 CFR 10-24 (U.S. Fish and Wildlife Service taking regulations); and assimilated state laws (hunting, fishing, etc.).

RELATIONSHIP TO OTHER GUIDANCE

Other guidance may be found in existing NPS policy documents, including NPS-28, the Cultural Resources Management guideline; and NPS-53, the Special Park Uses guideline. In this Guideline, see Chapter 2, Vegetation Management, Native Animal Management, Freshwater Resources Management, Marine Resources Management, and Endangered, Threatened, and Rare Species Management, and Chapter 3, Hunting and Trapping, Fishing, and Minerals Management.

PROGRAM GUIDANCE

I. User Eligibility

The consumptive use of park resources for subsistence and other traditional uses is limited to groups or individuals specifically identified in statutory law (including laws of general applicability such as ANILCA), or specific enabling legislation for a park, or by treaty. In many instances, authorized traditional users are members of a Native American group as identified in NPS Management Policies, Chapter 8. However, in some areas authorized users may include other ethnic groups.

ANILCA and NPS regulations (36 CFR 13 Subpart B) authorize subsistence use of preserves and of specific parks and monuments in Alaska by local rural residents, both native and non-native, who are identified as having a personal or family history of customary and traditional uses of renewable resources in a particular park.

II. Management of Consumptive Uses

The law or treaty authorizing traditional use of park resources may specifically define which resources may be used, the means of taking or harvesting the resource, and the uses for which such resources may be taken. Some general categories of authorized traditional uses include ceremonial or medicinal uses, arts or handicraft uses, and other subsistence uses. Resources authorized to be taken may include wildlife, fish, and plants or plant products, including wood. In some instances, including by ANILCA subsistence in Alaska, resources taken or products crafted from such resources may be bartered or sold to a limited extent to help support a subsistence economy.

Unless otherwise specified by law or treaty, no park resource used for subsistence or traditional Native uses should be managed specifically for consumption (i.e., maximum sustained yield) or to the detriment of other park resources. Instead, such resources should be managed so as to maintain a healthy and natural balance with other resources in the existing park ecosystem. Consumptive use of small or declining populations can be regulated or prohibited. Managers will

need to rely on a sound research and monitoring foundation in order to determine the status and condition of specific populations and park ecosystems.

III. Monitoring Consumptive Uses

Consumptive use should be monitored. To develop an informed basis for identifying and monitoring customary resource uses, traditional use studies (resource ethnographies) and other research should be conducted consistent with Servicewide ethnographic standards. Methods should be developed to monitor traditional uses. Information collected can be used to evaluate impacts of traditional consumptive uses on harvested populations and associated ecosystems. Regulations should be proposed to other regulating entities, or promulgated by the NPS, to assure the continuation of healthy and natural populations while accommodating the authorized traditional use of the resource.

Assimilating state hunting and fishing laws and regulations may be the most appropriate avenue for regulating consumptive use activity in some instances. However, where overall responsibility for ensuring the continuation of traditional uses of resources on federal public lands lies with the federal government, as in the case of ANILCA subsistence in Alaska, participation in inter-departmental federal rulemaking may be necessary (see 50 CFR 100). Promulgation of NPS regulations in 36 CFR may also be appropriate for regulating traditional consumptive uses.

IV. Alaska

The opportunity for the continuation of nonwasteful subsistence uses of fish, wildlife, and other renewable resources was provided for in legislation in all or portions of specified parks, monuments, and preserves established or expanded by ANILCA.

Subsistence use of all NPS units in Alaska is to be accorded priority over other uses of resources on those lands. The NPS must manage, and advise other management entities as appropriate, regarding the identification of eligible subsistence users, access issues, and the taking and use of renewable resources.

ANILCA provides that the State of Alaska manage season and bag limits, and methods and means regulation of the taking of fish and wildlife for subsistence purposes as long as the priority for subsistence use assured by ANILCA is effectuated. If the State is unable to comply with the provisions of ANILCA, the Secretary of the Interior is to assume control of the regulation of taking of fish and wildlife on public lands. In 1990, the State fell out of compliance with ANILCA, and the federal government assumed control of the taking of fish and wildlife on federal public lands.

In specific regard to subsistence hunting in parks and monuments where allowed, ANILCA established subsistence resource commissions. Those commissions recommend subsistence hunting programs, for their respective areas, to the Secretary of the Interior. Programs should be prepared

using technical information and other pertinent data assembled or produced by necessary field studies or investigations conducted jointly or separately by the technical and administrative personnel of the State and the Department. The program should also incorporate information derived from local public meetings and input from local advisory committees and regional councils established pursuant to Section 805 of ANILCA. The Secretary must promptly implement the plans unless such plans violate recognized principles of resource conservation, threaten healthy native animal populations, are contrary to the purposes for park or monument establishment, or would be detrimental to local subsistence users. Managers should maintain communications with commission members on management actions related to, or affecting, subsistence in park or monument areas. Managers should also remain aware of the proceedings of regional advisory councils and local advisory committees which may relate to subsistence users of parks, monuments, and preserves.

In Alaska, impacts of proposed federal actions upon subsistence uses are required to be evaluated pursuant to Section 810 of ANILCA. Consequently, managers must routinely document such evaluations of proposed actions.

The subsistence authorizations of ANILCA should not be considered to be the exclusive legislative authorization of traditional uses in Alaska. As an example, Native Americans may be authorized to make traditional use of resources on parklands in Alaska under the American Indian Religious Freedom Act.

V. Access

Access to locations in parks for subsistence or other traditional uses is governed by applicable provisions of statutory law or regulations. A permit must be issued for access to areas otherwise prohibited, restricted, or regulated pursuant to existing regulations at 36 CFR 1.5 (36 CFR 13, Alaska).

In parks that normally charge entrance or recreation fees, such fees will not be charged to individuals or groups participating in subsistence or other traditional use activities. (See Management Policies 8:9.)

VI. Traditional Uses and Recreational Uses

Visitor recreational use should, to the extent possible, be separated from traditional use areas. Information regarding areas and seasons of hunting, trapping, fishing, and gathering activities should be provided to the recreational public for purposes of discouraging interference with these activities. Recreational visitor use permits should contain related restrictions when appropriate and necessary. Information on the location and nature of sacred sites must not be given to the public. (See Management Policies 8:9.)

ROLES AND RESPONSIBILITIES

I. Parks

A. Other than Alaska

In parks outside of Alaska, superintendents are responsible for managing authorized traditional uses, including hunting, trapping, fishing, and gathering activities, unilaterally, or, as appropriate, in coordination with other authorized entities (i.e., state fish and game officials, U.S. Fish and Wildlife Service, etc.). Superintendents coordinate the development of appropriate field studies and investigations to determine harvest levels, seasons, etc. (see Monitoring Consumptive Uses, above, and Chapter 3, Hunting and Trapping, and Fishing). Superintendents should confer with the appropriate specialist in the development of traditional ethnographic resource use studies.

Prior to taking actions that may affect authorized traditional uses, the superintendent should consider all relevant information about the potential effects of the action on traditional uses and traditional user groups. Relevant information should reflect consultations with federal, state, local, and tribal authorities, and the public (as appropriate) and analysis of resource-specific, ethnographic, socioeconomic, and other data, in accord with legal, regulatory, and policy requirements.

B. Alaska

In parks, monuments, and preserves where subsistence uses are authorized by ANILCA, federal subsistence season and bag limits and methods and means regulations apply, unless superseded by more specific NPS regulations. **Superintendents** must also manage subsistence activities pursuant to NPS subsistence regulations, and implement recommendations of subsistence resource commissions regarding subsistence hunting which have been approved by the Secretary of the Interior.

In accordance with Section 816 of ANILCA, 36 CFR 13.30 and 13.50, and after consultation with the Regional Director, a superintendent may close an area to subsistence uses of a particular fish or wildlife population only for reasons of public safety, administration, or to assure the continued viability of a particular fish or wildlife population.

Superintendents should manage traditional uses other than ANILCA subsistence uses as described in A, above.

II. Region

A. Alaska

The **Alaska Regional Office** is responsible for developing regionwide NPS ANILCA subsistence policy. The region is also responsible for participating in, and coordination with, interdepartmental

Federal Subsistence Board actions regarding subsistence taking of fish and wildlife on federal public lands. In addition, the regional office is responsible for coordinating proposals to the state fish and game boards for changes to any state regulations affecting subsistence on parklands.

III. Washington Office

The **Ranger Activities Division** is responsible for assisting the Alaska Regional Office in the implementation of any necessary Alaska subsistence regulations.

The **Anthropology Division** is the lead office for the development and interpretation of NPS Native American policies.

IV. Department

The Secretary of the Interior is the only approval authority for ANILCA subsistence hunting programs developed by park and monument subsistence resource commissions.

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ADMINISTRATIVE USES OF RESOURCES

Administrative use of resources is defined as the use or alteration of a natural resource in the administration of park operations. Administrative uses of natural resources cover a wide spectrum of activities Systemwide that can, if not managed with sensitivity, lead to significant localized resource impact. In some instances, this impact can be long-lasting. All administrative uses of resources must be consistent with NPS policy and with park management objectives and should seek to minimize damage to the resource. All actions should be documented in an approved resource management plan and must be in compliance with the National Environmental Policy Act (NEPA) and other relevant environmental legislation. Rather than develop a comprehensive list of all possible administrative uses of park natural resources, this section provides examples of some of these uses and identifies the existing procedures that should be followed to ensure protection of park resources.

POLICY AND PROGRAM OBJECTIVES

NPS management policy on the use of natural resources is primarily directed to the visiting public and special users. The objective in this policy is to perpetuate and protect the park's natural ecosystems and native species while providing an enjoyable visitor experience. NPS Management Policies specifically addresses the administrative uses of resources only in regard to use of materials from borrow pits and other sand and gravel sources, and use of soils and plants salvaged from construction sites (9:4). However, it can reasonably be inferred that superintendents are responsible for achieving these same objectives in all types of stated administrative undertakings.

AUTHORITIES

See the discussion of general authorities in Chapter 1.

RELATIONSHIP TO OTHER GUIDANCE

Related guidance is provided in NPS-40, the Dams and Appurtenant Work, Maintenance, Operation, and Safety guideline; NPS-53, the Special Park Uses guideline; NPS-12, the Environmental Compliance guideline; and NPS-65, the Explosives Use Policy and Blasting Program guideline. See also the following Special Directives: 80-6, Limitation for Construction of Buildings in National Parks; 82-6, Policy on Dead and Down Wood and Wood Products; 83-4, Military Operations in the National Park System; 87-3, Conservation of Archeological Resources; and 89-1, Concessions Planning Considerations for General Management Plans and Development Concept Plans.

In this Guideline, see Chapter 3, Minerals Management, Chapter 4, Environmental Compliance, and Chapter 5, Research Administration, Collections, Special Use Permits, and Interpretation.

PROGRAM GUIDANCE

Administrative uses of park natural resources may result from maintenance, interpretive, resource management, or research activities. Examples include:

- use of locally obtained park resource materials for trail construction, maintenance, or rehabilitation;
- use of native seed or other locally obtained plant materials for restoration of native ground cover in previously disturbed sites;
- materials such as sand, gravel, stone, dead and down wood, and wood products that are extracted, quarried, or harvested to provide locally available (and less costly) materials for road and bridge construction, firewood, etc.;
- grazing of pack horses and other stock;
- construction of clearings for helispots;
- other site utilization for a variety of structures and utilities; and
- park interpretive programs that provide "hands on" experiences for the visitor, such as living displays of plants or animals or gold panning experiences.

To ensure adequate protection of resources from administrative functions, all administrative uses of resources should be documented in an approved resource management plan. Where possible, sites intended for administrative uses should be documented as part of the management zoning in the general management plan.

All actions taken by superintendents that affect resources must be in compliance with the National Environmental Policy Act (NEPA). Exceptions or exclusions for actions that are administrative are identified in NPS-12, the Environmental Compliance guideline. In addition, all actions that may affect historic or prehistoric properties listed, or eligible for listing, in the National Register of Historic Places must be in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended.

ROLES AND RESPONSIBILITIES

The **superintendent** should examine all internal park operations for potential impacts on natural resources and ensure that required planning and documentation procedures are followed.

SPECIAL USE PERMITS

NPS Management Policies (8:10) defines a special park use as "any activity that is proposed for, or exists within, a park and that requires written permission from an NPS official in order to take place." The **special use permit** is the document issued by the superintendent to allow such use of NPS administered resources or facilities. It is used for all special park uses that do not have their own permitting instrument. The superintendent is responsible for evaluating all proposals for special park uses "... in terms of their consistency with all applicable legislation, executive orders, and regulations, as well as their actual and potential effects on park values, purposes, and resources." (Management Policies 8:1). Special park uses may be permitted only where the superintendent determines that the activity will not cause any derogation of these values, purposes, and resources, except where certain uses are directly and specifically authorized by federal law.

Obviously, special park uses can have negative effects on park natural resources. The park resource manager therefore serves as a key support to the superintendent in evaluating special use permit applications and determining the potential impacts of a proposed use and whether these impacts are in derogation of park values. If a use is specifically authorized by law, the resource manager should recommend permitting conditions and mitigation measures to be taken by the permittee. Because permitted activities may be controlled or terminated, and renewal requests denied, where the superintendent determines that the activity is in derogation of park values, purposes, and resources, the resource manager should also carefully monitor all existing permitted uses and report existing or potential resource impacts to the superintendent.

NPS-53, the Special Park Uses guideline, should be consulted for specific guidance on the requirements, regulations, procedures, and criteria associated with the review, determination, and administration of special park use requests, and the evaluation and renewal of existing permitted special park use activities. The special park uses coordinator in the regional office can provide further guidance on the management of special park uses.

CHAPTER FOUR: PLANNING

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RESOURCE MANAGEMENT PLAN

The purpose of this section is to describe what a resource management plan (RMP) is and how it relates to other NPS planning and management activities, as well as to give general guidance about what the plan should contain and how it should be used. Detailed guidance on the development of the RMP is provided in the Resource Management Plan Instructions (last issued March 15, 1989).

DEFINITIONS

Action plan A plan used to provide more detailed description and analysis of a particularly complex and/or controversial action contained in the RMP.

Activities Actions performed on an ongoing, regular basis as part of the park's management of natural resources, usually park base-funded.

Natural resources component The portion of a park's RMP which deals with natural resources.

Projects One-time actions performed as the need arises, sometimes park base-funded, but often funded by special, nonpark funds, usually on a nonrecurring basis.

Resource management plan (RMP) The plan which details how both natural and cultural resources will be managed in a given park.

POLICY AND PROGRAM OBJECTIVES

> Each park with natural resources to manage will prepare and periodically update a natural resource component for its resource management plan. The plan will identify, define, and program the monitoring, inventory, research, mitigation, and enforcement activities required to perpetuate park natural resources and natural processes, achieve the park's purposes and objectives, and regulate the use of the park. (Management Policies 4:2)

The objectives of the natural resources component of an RMP are to:

- summarize the natural resource values and purposes of the park;
- analyze the significance of natural resource management needs and problems and rank them in importance;
- propose specific actions, including funding and staffing requirements, for dealing with the most important problems;

- present a multi-year program to achieve measurable progress in accomplishing the proposed actions;
- identify and program needed scientific research to support management actions;
- provide for an annual review and recording of accomplishments to measure the effectiveness of actions;
- provide the forum for an interdisciplinary approach to the park's natural and cultural resource management issues; and
- provide for transfer of information on the park's resource management program to the park staff and public.

AUTHORITIES

See the discussion of general authorities in Chapter 2.

RELATIONSHIP TO OTHER GUIDANCE

Resource management plans are part of a larger planning process which is described in NPS-2, the Planning Process guideline. The RMP draws its major objectives from the park's comprehensive planning documents: the statement for management (SFM) and the general management plan (GMP). Studies called for by the RMP may, in turn, result in new knowledge which will influence the objectives and management needs previously defined in the SFM and GMP. An RMP should be examined for possible updating any time the natural resource objectives in the SFM are changed.

RMPs take the resource management objectives a step further and describe a specific plan of action, which is used to prioritize requests for special funding and to guide the expenditure of that portion of park base funds devoted to natural resource management.

Many management actions involve or affect both natural and cultural resources, such as vegetation management to maintain a cultural landscape or integrated pest management within a historic structure. One of the objectives of the resource management plan is to foster increased integration of natural and cultural resource management actions in the park, through use of integrated natural/cultural project statements and cross-referencing of related project statements.

In cases where a park's natural resources are in a cultural zone, they should be managed to preserve and foster appreciation of the cultural context and theme. In this case, policy for managing the natural component is primarily guided by NPS-28, the Cultural Resources Management guideline. The RMP is covered under the Programmatic Memorandum of Agreement between NPS and the Advisory Council on Historic Preservation and National Conference of State

ROLES AND RESPONSIBILITIES

I. Park

The **superintendent** is responsible for preparing the RMP. The park **resource manager** normally carries out the assignment, frequently with advice and assistance from the regional office. Input from all park divisions playing a role in the management and protection of natural resources is necessary to ensure that all the resource-impacting activities are considered and that the entire park staff understands and supports the action plan presented by the RMP. Resource managers should assure that other divisions (e.g., maintenance, interpretation, ranger activities) have accurate information on resources and an adequate understanding of resource management goals and objectives and their rationale.

Environmental compliance staff should be consulted early in the planning process regarding the compliance requirements of various projects in the RMP. Only the superintendent can sign memoranda classifying certain projects as categorical exclusions to the requirements of the National Environmental Policy Act (NEPA).

II. Region and Washington Office

Regional chief scientists and chiefs of resource management should assist parks in developing the RMP. They also serve as staff to the Regional Director in coordinating the regional office review of the draft RMP. Approval of the RMP is the responsibility of the **Regional Director**, who is required to provide an opportunity for review by the **Associate Director, Natural Resources** before approving any plan with a natural resource component.

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SPECIAL PARK DESIGNATIONS

This section discusses the purpose, establishment, and management of Wilderness Areas, National Natural Landmarks, Research Natural Areas, Experimental Research Areas, World Heritage Sites, Biosphere Reserves, Wild and Scenic Rivers, and National Trails as these designations apply to NPS units. It also briefly mentions Marine/Estuarine Sanctuaries, RAMSAR sites, Critical Habitat, and Class I and Class II areas under the Clean Air Act. These areas, except for Marine/Estuarine Sanctuaries (which may adjoin NPS units), may occur within a park, coincide with a park, or occur both within and outside a park. Exhibit 1 summarizes this section in chart form.

WILDERNESS AREAS

I. Definition

A unit of the National Wilderness Preservation System is a site designated by Congress and legally protected as wilderness in perpetuity. The Wilderness Act defines wilderness as follows: "...generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable...." In Alaska, the Alaska National Interest Lands Conservation Act (ANILCA) modifies the Wilderness Act relative to its application in the lower 48 states, but the basic definition is the same. See NPS Management Policies, Chapter 6 for modifications that apply in Alaska.

II. Policy and Program Objectives

The NPS Management Policies states that:

> The National Park Service will manage wilderness areas for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness. Management will include the protection of these areas, the preservation of their wilderness character, and the gathering and dissemination of information regarding their use and enjoyment as wilderness. Public purposes of wilderness will include recreation, scenic preservation, scientific study, education, conservation, and historical use. (6:1)

III. Authorities

Legislation affecting wilderness area designations includes the Wilderness Act of 1964, and the Alaska National Interest Lands Conservation Act of 1980.

IV. Relationship to Other Guidance

In this Guideline, see Chapter 3, Backcountry Recreation Management.

V. Program Guidance

A. Selection Criteria

Each unit must be at least 5,000 acres or be of sufficient size to make practicable its preservation and use in an unimpaired condition. See the Wilderness Act for further criteria.

B. Designation Procedure

1. Congress, a general management plan, or other authority identifies potential wilderness area(s) in a park.

2. The NPS studies suitability of the area(s) and the management constraints involved, holds public hearings, and, where suitable, prepares a formal proposal and an Environmental Impact Statement (EIS).

3. The formal proposal and EIS are transmitted to the Congress through the Secretary of the Interior.

4. Congress holds hearings and makes a decision, through legislation.

C. Relationship to NPS Planning

Wilderness is usually confined to the natural zones, but may contain limited acreage in cultural or special use zones.

D. Management

The scientific value of Wilderness Areas derives from their undisturbed natural condition and from the wealth of biological diversity they contain. Usually they provide excellent benchmarks of environmental quality. Research is encouraged, provided it does not negatively impact the resource, intrude on the aesthetics, or conflict with preservation of wilderness values. Manipulative research (research in which conscious alteration of the existing condition is part of the experimental design) may be allowed only where management of the wilderness requires information that can be obtained only through experimental research within the wilderness. Restoration of the wilderness resource must follow any manipulative research conducted. In resource management, only those practices compatible with preservation of wilderness values are permissible. Interpretation or education involving permanent facilities generally is not allowed within a Wilderness Area. The availability, location, and regulations on the use of Wilderness Areas should be made widely known to the public to promote enjoyment of these areas without harming their integrity.

Primitive trails for foot and horse travel are permissible. Improvements for the convenience of users are not allowable. Only those structures necessary for meeting the purpose of maintaining the enduring resource of wilderness are permissible.

Each federal agency has the responsibility to ensure protection of wilderness values as part of its overall management responsibility. Allocation of funds for park operations should ensure that adequate personnel and funds are available for protection, inventory and monitoring, and management of wilderness resources.

VI. Roles and Responsibilities

The park's **wilderness management coordinator** is responsible for developing and implementing the park's wilderness management plan. The **superintendent** approves the wilderness management plan and is responsible for ensuring that it is in accordance with the Wilderness Act, and that the requirements of the plan are met.

NATIONAL NATURAL LANDMARKS

I. Definition

National Natural Landmarks are nationally significant natural areas that have been designated by the Secretary of the Interior. To be nationally significant, a site must be one of the best examples of a type of biotic community or geologic feature in its physiographic province. National Natural Landmarks (NNLs) can be designated on both private and public land, including NPS units.

II. Policy and Program Objectives

The objectives of the NNL program are to identify, recognize, and encourage the protection of sites containing the best remaining examples of ecological and geological components of the nation's landscape. Within the parks, sites that have been determined to qualify may be nominated to the Secretary for NNL designation.

III. Authorities

Legislative authority for the NNL program is found in the Historic Sites Act of 1935 and the General Authorities Act.

IV. Relationship to Other Guidance

See the National Natural Landmarks Program regulations, 36 CFR 62.

V. Program Guidance

A. Selection Criteria

The determination that a site is one of the best examples of a particular feature in a given natural region is based on the primary criteria of illustrativeness and condition of the specific feature, and on the secondary criteria of rarity, diversity, and value for science and education.

B. Designation Procedure

The authority for administering the NNL Program has been delegated by the Secretary of the Interior to the NPS. Potential landmarks are identified in contracted natural region surveys and through suggestions of individuals or non-NPS groups (e.g., state natural area programs or federal land management agencies).

To determine whether a site within a unit of the National Park System qualifies for potential designation as a NNL, the park should consult with the regional NNL coordinator. For highly qualified sites, the regional coordinator arranges for an onsite evaluation to be conducted, usually under contract by a university scientist. Completed onsite evaluation reports are then peer-reviewed by other scientists, and then forwarded by the regional coordinator to the NPS Washington Office NNL staff. A final judgement is then made by the Washington Office NNL staff, based on all available information, as to whether the site appears to meet the criteria for national significance. An area that is determined to be qualified may be nominated to the Secretary of the Interior for possible NNL designation.

C. Relationship to NPS Planning

NNLs occur both within and outside the National Park System and complement it in two ways: (1) as a means for recognizing and preserving nationally significant areas that cannot or need not be managed by the NPS; and (2) as a form of recognition for areas within the National Park System deserving special attention and management. NNLs should be designated as natural zones.

D. Relationship to Other Designations

NNLs may also meet criteria for Research Natural Areas, and can occur in Wilderness Areas or in parks also designated as Biosphere Reserves or World Heritage Sites.

E. Management

Sites may be used for research; however, this use is subsidiary to protection of the site's integrity. Likewise, any resource management actions must avoid damage to site integrity.

Unless the site is fragile, NNLs provide an excellent opportunity for interpretation of special park resources. The location of exceptionally fragile landmarks should not be widely publicized, unless visitation is carefully monitored to ensure their protection. Depending on the nature and fragility of the resources designated, it may be necessary to restrict recreational use to prevent impacts. Development should not be permitted, unless it is compatible with the resources and needed for interpretation or educational use. In some cases, limited funds may be available to assist in monitoring the condition of NNLs, and, in some cases, technical assistance may be available from the regional NNL coordinator or the Washington Office.

VI. Roles and Responsibilities

NNL designation does not change the ownership of a site and does not dictate activity. Management remains the responsibility of the landowner or administrator. **Superintendents** are responsible for ensuring the continued integrity of NNL sites within their parks. The occurrence and significance of any NNLs within the park must also be considered in appropriate park plans and in environmental compliance. The Secretary is required to provide an annual report to the Congress on any damaged or threatened NNLs (the Section 8 Report). Superintendents may be asked to assist the regional NNL coordinator in making NNL site inspections for this report.

Regional NNL coordinators are responsible for NNL program operations in the regions, including coordinating NNL site inspections for the annual Section 8 Report.

The Washington Office, Wildlife and Vegetation Division is responsible for overall program policy and direction, preparation of new site nominations, coordination with other agencies and organizations, and completion of the annual Section 8 report.

RESEARCH NATURAL AREAS

I. Definition

Research Natural Areas (RNAs) are part of a national network of field ecological areas designated for research and education and/or to maintain biological diversity. An RNA is a physical or biological unit established within a typical example of an ecological community type, preferably one having been little disturbed in the past, and in which current natural processes are allowed to continue. The tract is set aside permanently and is managed exclusively for approved nonmanipulative research--research that samples but does not alter the existing condition. A RNA in a park is designated by the NPS and is not based on any specific law.

II. Policy and Program Objectives

The NPS Management Policies states:

> Prime examples of natural ecosystems and areas with significant genetic resources with value for long-term baseline observational studies or as control areas for comparative studies involving manipulative research outside the park may be recommended by superintendents to the Director for designation as research natural areas. Superintendents will cooperate with other federal land managers in identifying park sites for designation and in planning research and educational activities for this interagency program. Research natural areas will be managed to provide the greatest possible protection of site integrity in accordance with their designation. Activities in research natural areas will be restricted to nonmanipulative research, education, and other activities that will not detract from the area's research values. (4:4)

Overall policy and management guidelines for RNAs are found in the 1977 publication, A Directory of Research Natural Areas on Federal Lands of the U.S.

Specific objectives of RNAs throughout the network are to:

1. preserve a wide range of undisturbed, representative areas that typify important forest, shrubland, grassland, alpine, wetland, and similar natural situations, that have special or unique characteristics, or provide outstanding examples of geological, biological, or ecological processes of scientific interest and importance;

2. preserve and maintain genetic diversity;

3. protect against environmental disturbance;

4. serve as reference areas for the study of ecological succession;

5. provide student and professional education;

6. serve as baseline areas for measuring long-term ecological changes; and

7. serve as control areas for comparing results from manipulative research.

III. Relationship to Other Guidance

See Appendix D in Federal Committee on Ecological Reserves, 1977, A Directory of Research Natural Areas on Federal Lands of the United States of America, USDA, Forest Service. In this Guideline, see Chapter 3, Research Uses.

IV. Program Guidance

A. Selection Criteria

RNAs usually should be selected from typical, preferably undisturbed, hydrogeologic (physical) areas or biotic community types. A map of these areas and community types in the park, and, if possible, in the park's biogeographical region, is a useful starting point. It is preferable that sites be relatively accessible.

The inclusion of at least one site in each of the major hydrogeologic areas and biotic community types represented in the park is a desirable long-range goal. Where possible, entire small watersheds should be selected, because they maintain interrelationships of terrestrial and aquatic systems, are particularly valuable as baseline areas for research and monitoring, and are easier to delineate and protect on the ground. Sites should be large enough to ensure unmodified conditions within their interiors. A rule of thumb is 100 to 10,000 acres. Existing sites used for long-term ecological monitoring should be considered. Areas that may be affected by future park development should be avoided.

The choice of areas to designate is best made from a list of candidate areas identified during a survey of potential sites conducted by an interdisciplinary team of scientists and resource managers representing in-house or other expertise in disciplines such as plant ecology, wildlife biology, and geomorphology. Wherever possible, identification of candidate sites should be made in cooperation with other land managing agencies in the same biogeographical region and should represent ecological conditions needed to complete the RNA network. Sites selected should be classified according to the ecological or other schemes provided in the 1977 RNA Directory.

B. Designation Procedure

The superintendent completes a Form 10-229, Natural Area Information, with an accompanying topographic map showing the boundaries of the RNA and cover type map, if available. In addition to information required on the 10-229, the following should also be described:

1. historical background and uses, including major research projects;

2. information concerning other special designations in the proposed areas, such as Wilderness, Wild and Scenic River, or other Congressionally designated areas;

3. inclusion of the RNA in park plans;

4. objectives in establishing the RNA and its suitability for fulfilling those objectives;

5. description of how the area fills a gap in the RNA network;

6. any endangered, threatened, rare, or unique species in the proposed area;

7. a description of the boundary location, including bearings and distances for any portion not sharply defined by topography;

8. any cultural resources in the proposed RNA; and

9. the title of person(s) responsible for coordinating research in the RNA and for maintaining the area's research data file.

The Form 10-229 and accompanying material are transmitted to the Regional Director for approval and then sent to the Washington Office, Wildlife and Vegetation Division, for review. Any site that qualifies is submitted through the Associate Director, Natural Resources, to the Director for approval. Approved sites are added to the list of such sites maintained by the Washington Office. Designation should be considered a permanent or long-term action that precludes nonconforming uses of the site.

C. Relationship to NPS Planning

Each designated RNA should be classified as a research natural area subzone within the natural zone in the park's general management plan. Revisions of the park's management zoning map may be included in the resource management plan to record new designations.

D. Relationship to Other Designations

RNAs can be designated in Wilderness Areas but then must be managed according to wilderness management policy.

E. Management

Baseline inventory and long-term ecological observations should be emphasized in these areas, as their foremost purpose is to create an ecological/environmental benchmark over time. Information and data from the site should be available in the park or at an associated CPSU for use by scientists. Temporary, semi-permanent, or permanent research structures or facilities are permitted if there is no practical alternative for achieving research goals, and where consistent with the general management plan and other park documents.

Resource use should be managed to prevent any activity that could lessen the site's integrity or permit interference with ongoing research projects. Consequently, camping, trail construction (except to provide essential access to established research facilities), vegetation management, range and pasture use, or mineral entry are not allowed. It may be appropriate to exclude all uses except nonmanipulative research. The site should be identified both narratively and on maps in the general management plan. To discourage inappropriate uses, the superintendent may provide

on-ground posting or fencing. Unless mitigating action is required under NPS policy or to meet the purposes of the RNA, catastrophic natural events, such as insect infestations, fire, and climatological phenomena should be monitored and allowed to take their course. Other guidelines on management can be found in the 1977 RNA Directory.

In order to provide scientists with a permanent tract on which there will be minimal interference in the conduct of needed research, interpretation will be provided primarily off-site, except in cases where well supervised on-site interpretation of ongoing research is possible. Guided educational use is compatible with the purposes of the designation provided visitors do not harm the integrity of the site in any way or interfere with scientific studies. The existence of these sites should be made known to scientists. Publications on research conducted in an RNA should reference the RNA where the research was conducted.

Any potentially disruptive recreational pursuits should not be allowed in these tracts because of the likelihood of negative effects on the ongoing research efforts. Development is not permissible with the exception of temporary, semi-permanent, or permanent research structures, utilities, and facilities that are in keeping with park planning objectives.

RNAs can accommodate many identified park research needs, and funding RNA use to meet these needs, especially for long-term research, should be encouraged.

V. Roles and Responsibilities

The park **superintendent** is responsible for preparing proposals to establish new RNAs and approving activities conducted in RNAs. One individual on the park science or resource management staff should be assigned the responsibility of coordinating activity on RNAs and maintaining RNA research data files. The **regional office** provides regional coordination of and assistance in RNA activities. The **Washington Office, Wildlife and Vegetation Division**, coordinates the overall RNA activity in the NPS by maintaining master files on existing sites throughout the System, updating the RNA Directory as required; providing NPS representation in interagency activities; and providing policy oversight. Interagency transfer of information about ongoing activities and research results is encouraged at all organizational levels.

EXPERIMENTAL RESEARCH AREAS

I. Definition

Experimental Research Areas are specific tracts that are permanently or temporarily set aside and managed for approved manipulative research, which is defined as research in which conscious alteration of the existing condition is part of the experimental design. Cutting and burning are two examples.

II. Policy and Program Objectives

Historically, the NPS has set aside small tracts for various types of manipulative research on a case-by-case basis to generate information needed for park management decisions. Such discretionary use of small parts of the park landscape is expected to become increasingly necessary in the future. Experimental Research Areas are to be established only when related to the long-term management requirements of a park as identified in the park resource management plan. They should be established in parts of park landscapes previously disturbed by man or natural causes, such as abandoned developments, road beds, farmland, dumps, logged areas, and storm impact areas; but if necessary they can occur in undisturbed habitat, such as in studies related to impact of human use, fire ecology, pest management, or exotic species. At the conclusion of the research project, the tract can be allowed to naturally recover to undisturbed conditions over time or it can be restored more quickly through active measures.

III. Authorities

The NPS Organic Act provides the authority to conduct research in parks, including the designation of Experimental Research Areas.

IV. Relationship to Other Guidance

In this Guideline, see Chapter 3, Resource Uses.

V. Program Guidance

A. Selection Criteria

Ideally, interdisciplinary study teams should be used to review potential sites and recommend those which have the best potential for meeting the information needs identified in the park resource management plan. Where possible, existing areas used for experimental research should be designated as Experimental Research Areas. Established areas should be as small as possible while still meeting the research purpose, should not affect other park resources, and should be interpretable to the public.

B. Designation Procedure

Same as for Research Natural Areas.

C. Relationship to NPS Planning

While normally located in the natural zone, Experimental Research Areas may also be located in a development zone or special use zone. In each case, an Experimental Research Area should be

delineated within the applicable zone in the park GMP. Revisions of the park's management zoning map, showing the new RNA designations, may be included in the RMP.

D. Relationship to Other Designations

Experimental Research Areas should not be located within a Wilderness Area except under certain well constrained conditions where management of the wilderness requires information that can be obtained only through experimental research within the wilderness.

E. Management

Research program and resource management considerations are the same as those for RNAs, except that manipulative research is permissible.

Management of other uses is the same as for RNAs. Educational value can be considerable if interpretation is well supervised.

VI. Roles and Responsibilities

Same as for RNAs.

WORLD HERITAGE SITES

I. Definition

A property, either natural or cultural, that is added to the World Heritage List if the World Heritage Committee determines that it has "outstanding universal value to mankind."

II. Policy and Program Objectives

"Natural [and cultural areas] believed to possess outstanding universal value as part of the world's natural [and cultural] heritage will be nominated to the World Heritage List....Once an [NPS] area is designated a world heritage site, the National Park Service will recognize the designation in public information and interpretive programs." (Management Policies 4:5 and 5:2) Listing properties on the World Heritage List is intended to encourage their preservation by recognizing their outstanding universal significance.

III. Authorities

Authorities for designation and management of World Heritage Sites include the Convention Concerning the Protection of the World Cultural and Natural Heritage, ratified by the United States Senate, October 26, 1973; and Title IV of the National Historic Preservation Act Amendments of 1980.

IV. Relationship to Other Guidance

See World Heritage Convention--Final Rules, Operational Guidelines for the Implementation of the World Heritage Convention, 1984, UNESCO, World Heritage Committee/2 revised (47 FR 23400).

V. Program Guidance

A. Selection Criteria

The Convention provides broad criteria addressing the nature and integrity of properties. In addition, the World Heritage Committee has adopted criteria which natural or cultural properties must meet to be included on the World Heritage List. These are set forth in 47 FR 23400 (no. 103).

B. Designation Procedure

Nations that are party to the Convention nominate their properties that appear to qualify for inclusion on the World Heritage List to the World Heritage Committee. In the U.S., the Assistant Secretary of the Interior for Fish and Wildlife and Parks, assisted by the Federal Interagency Panel (FIP) for World Heritage, is responsible for approving U.S. nominations and for transmitting nominations to the World Heritage Committee for consideration. Any individual, organization, or agency may recommend a site for U.S. nomination to the World Heritage List. Site administrators are responsible for preparing U.S. nominations, with the assistance of authorities having the most detailed knowledge of the significance of the site. Nominations are coordinated by the NPS, Office of International Affairs, which arranges for their preparation, concurrence of the site administrators, technical review, and submission to the FIP. Proposals are reviewed by the FIP, which approves sites for inclusion on the U.S. Indicative Inventory, a preliminary listing of candidate sites published in the Federal Register on which public comment is requested. The Panel considers public comments and site qualifications in deciding whether to proceed with nomination. Nominated sites approved by the Panel are then forwarded to the Assistant Secretary for Fish and Wildlife and Parks for signature and transmitted to the World Heritage Committee for review and official designation.

C. Relationship to NPS Planning

The boundary of a World Heritage Site usually follows park boundaries, although this is not mandatory, as the boundary of the internationally significant resource may not coincide with the park boundary. Hence, zoning within a park is generally not a consideration. Independence Hall, a component of Independence National Historical Park, and Olympic National Park are examples of World Heritage Sites where the boundaries are different from the park boundaries.

D. Relationship to Other Designations

Sites can be nominated wherever qualified areas exist, including those already having other legislative or administrative designations. To be eligible for nomination, a site must have previously been determined to be nationally significant, e.g., as a national park or by designation as a National Natural or Historic Landmark.

E. Management

Research in designated World Heritage Sites is encouraged by treaty and law. Sites should be managed to avoid any negative impact on the site's integrity. The nomination for the site must include evidence of the legal measures taken to ensure the preservation of the property and its environment. The nomination, upon signature, promises the preservation of the property under the terms of the treaty.

The same standards and considerations with respect to interpretation, educational use, and publicity, as apply to national parks apply to World Heritage Sites. However, since a World Heritage Site has been determined to possess outstanding universal value to mankind, this recognition should be publicized at the site through bronze plaques, explanatory brochures, and related interpretive programs covering the range of the program's implications from site specific to international; the concept of "World Heritage" should be introduced as appropriate. Management of recreational uses and development is the same as for national parks.

The World Heritage Fund, administered by the World Heritage Committee, provides a minimal amount of money which all participating countries can apply for. Grants are awarded for emergency site assistance; technical assistance, including training; assistance in preparing nominations or making a national inventory; and public information programs.

VI. Roles and Responsibilities

The World Heritage Committee, supported by UNESCO, guides the activity worldwide, while the **Assistant Secretary for Fish and Wildlife and Parks**, assisted by the Federal Interagency Panel for World Heritage, guides the activity in the United States. Preparation and submission of U.S. nominations is coordinated through the **Washington Office, Office of International Affairs.** Appropriate **cultural or natural resource divisions** of the Washington Office are responsible for providing technical review and, where necessary, revising nominations. The performance of administrators of World Heritage Sites (including park superintendents) should be assessed in part on how well the values of the site are interpreted and the resources protected and managed. See also Designation Procedure, above.

BIOSPHERE RESERVES

I. Definition

A site, usually representative of a biogeographic province and therefore typically large, that is part of a worldwide network of natural reserves set aside for conserving genetic resources, facilitating long-term research and monitoring, and encouraging education, training, and demonstration of sustainable resource uses. A Biosphere Reserve consists of a strictly protected core area and usually a buffer zone, where manipulative research and other uses compatible with protection of the core area may be conducted. There also may be a generally undemarcated transition area, or zone of cooperation, where knowledge and skills developed in the Biosphere Reserve are applied regionally and where uses are managed cooperatively in harmony with the purposes of the Biosphere Reserve.

It is not possible to carry out fully the multiple functions of Biosphere Reserves in national parks or other individual protected areas because of restrictions in such areas on manipulative research and consumptive uses. Therefore, most Biosphere Reserves being established in the U.S. today consist of ecologically and functionally complementary sites under different administrators. These sites may be either contiguous or comprise a cluster of geographically separated but functionally related sites. The Biosphere Reserve thus can serve as a framework for cooperation regionally, as between a park and adjacent lands, on resource issues of mutual interest. Institutionalized regional Man and the Biosphere (MAB) programs are being developed to accomplish this cooperation. The addition of new administrative areas to existing Biosphere Reserves is specifically encouraged in order to provide opportunities for developing the conservation, information-sharing, and development roles.

II. Policy and Program Objectives

The NPS Management Policies states:

> Individual park ecosystems or park lands that are components of regional ecosystems believed to be internationally significant examples of one of the world's natural regions may be nominated for designation as biosphere reserves....Working within the U.S. MAB program, the National Park Service will assist in determining the suitability and feasibility of including parks in U.S. biosphere reserve nominations, participate in research and educational activities, and furnish information on its biosphere reserves for inclusion in domestic and international information systems. The designation of park lands as international biosphere reserves will not alter the purposes for which the parks were established or change the management requirements. To the extent practicable, superintendents of parks participating in the international network will incorporate biosphere reserve objectives into statements for management, general management plans, action plans, and park interpretive programs. Superintendents will

pursue opportunities to use the biosphere reserve network as a framework for local, regional, and international cooperation. (4:4,5)

Biosphere Reserves are dedicated to research on the function and management of ecosystems, and on ways to support sustainable, integrated development. Research results are communicated globally through the MAB information system. Biosphere Reserves are also intended to be educational, demonstration, and training centers for sharing such knowledge. NPS Biosphere Reserve units should identify inventory, monitoring, research, management, interpretive, and demonstration projects dealing with regional and global issues which will comprise the park's Biosphere Reserve program.

III. Authorities

The authority for NPS involvement in the Biosphere Reserve program is based on the NPS Organic Act.

IV. Relationship to Other Guidance

See Guidelines for the Selection and Coordination of Biosphere Reserves in the United States; Interim Guidelines for Identification and Selection of Coastal Biosphere Reserves; U.S. MAB Report No.6; Action Plan for Biosphere Reserves (Nature and Resources 20(4)); and Practical Guide to MAB, pp. 18-26. UNESCO. (All the above are available from the Washington Office, Wildlife and Vegetation Division.)

V. Program Guidance

A. Selection Criteria

To be selected as a Biosphere Reserve, a park must contain an effectively protected, minimally disturbed core area of value for nature conservation, research, and education. The core area should be typical of a biogeographic unit and large enough to sustain viable species populations representing all trophic levels in the ecosystem. For details on selection criteria see references in Relationship to Other Guidance, above.

B. Designation Procedure

No legislation is required to establish a Biosphere Reserve. Candidate areas are identified by a multidisciplinary scientific panel convened under the auspices of the U.S. MAB Program. Panel reports are forwarded to the executive director, MAB Secretariat, Department of State, for review and approval. The U.S. MAB National Committee then must obtain the official concurrence of the site administrator(s). The administrator(s) of each proposed site are asked to complete a nomination form which contains a declaration of commitment to UNESCO's Action Plan for Biosphere Reserves, which sets forth the functions of Biosphere Reserves and the objectives of the

international Biosphere Reserve program. The nomination form also requires the administrator to identify, in a preliminary way, anticipated implementing actions, and to provide a map of the proposed Biosphere Reserve. To facilitate understanding of the concept and a basis for beginning implementation, U.S. MAB may convene, at the administrators' request, informal discussions, workshops, or public meetings. Once the nomination forms have been received, U.S. MAB prepares a consolidated nomination form based on the individual forms prepared by the participating sites. The nomination, signed by the Chairman of the U.S. MAB National Committee, is transmitted to the UNESCO MAB Secretariat for final approval and designation.

C. Relationship to NPS Planning

Biosphere Reserves consist of a core area, buffer zone, and sometimes a transition area (see Definition, above). In parks that are Biosphere Reserves or constitute parts of one, the natural zone usually constitutes the core area, and other park zones form the Biosphere Reserve buffer zone, although these zones have restrictions on manipulative research. The transition area usually has an open boundary which may vary in space and time depending on the cooperative activities taking place.

D. Relationship to Other Designations

Wilderness Areas are frequently designated as core areas of Biosphere Reserves, or are included within larger areas delineated as core areas. Biosphere Reserves may also include Research Natural Areas, Experimental Research Areas, World Heritage Sites, National Natural Landmarks, Wild and Scenic Rivers, and National Trails.

E. Management

Research in Biosphere Reserves addresses needs of the biogeographic region in which the park is located. Long-term monitoring and research are important for obtaining baseline data, trends data, and understanding of ecological processes, knowledge that can be applied in sustainable management of the resources of both the park and the larger region. Much of the research in Biosphere Reserve parks should be designed to address issues of concern to the region as well as the park, and, when the park is part of a multiple-unit Biosphere Reserve, research should be coordinated with research in the other units. Cooperative research with other Biosphere Reserves, in both the U.S. and other countries, should be encouraged. Appropriate management of natural and other zones in a park should be compatible with their respective status as core area and buffer zone of a Biosphere Reserve.

Communication with the public in a Biosphere Reserve should focus on man-environment relationships and take a world view. The role of the park as a Biosphere Reserve should be interpreted. Demonstration and training activities designed to transmit learning that can be applied beyond park boundaries should be encouraged. Parks designated as parts of Biosphere Reserves should publicize this status through plaques, brochures, audio-visual presentations, exhibits, and

other materials describing the MAB Program, as well as the role of Biosphere Reserves in general and the NPS unit in particular.

The core area of a Biosphere Reserve must remain an essentially undisturbed, unmanipulated, and protected area; recreational uses typical of primitive and wilderness areas are suitable. The buffer zone includes all parts of the park outside the core area; a wide range of recreational activities may occur in these areas, provided that they are compatible with maintaining the ecological processes and biological diversity of the core area.

Development in core areas should be the minimum required to carry out essential management and related scientific activities; standards applicable to wilderness and primitive areas apply. In buffer zones, development allowable in accordance with NPS management zoning is appropriate provided it is implemented and operated so as to maintain the ecological integrity of the core area.

Government agencies are responsible for funding their own research in Biosphere Reserves, although limited financial assistance can be obtained for certain types of projects through the U.S. MAB National Committee. Priority should be given to funding long-term research, cooperative studies, and demonstration projects under this program.

VI. Roles and Responsibilities

Superintendents of Biosphere Reserve parks are responsible, in cooperation with the regional chief sientist, for developing and operating a program of interdisciplinary research that includes studies on regional and global issues, for using the resulting information in developing cooperative approaches to management, and for communicating the results of these studies to the public. All park personnel should be informed about the purpose of Biosphere Reserve designation so they can communicate its role to the public. Each regional office should designate an individual responsible for coordinating MAB activities. **Regional MAB coordinators** should work closely with the **Washington Office MAB coordinator** in the selection of Biosphere Reserves and planning activities in NPS Biosphere Reserve areas.

Biosphere Reserve activities are coordinated by the **Biosphere Reserve Coordinating Committee,** on which the NPS is represented. The Coordinating Committee recommends Biosphere Reserve priorities and approval of Biosphere Reserve nominations, and assists with coordination of domestic and international MAB activities in Biosphere Reserves. The **U.S. MAB National Committee** gives policy guidance and sets priorities for the U.S. MAB program. It receives administrative support from a **U.S. MAB Secretariat** in the Department of State. UNESCO's International Coordinating Council for MAB provides overall policy direction; a Secretariat in UNESCO's Division of Ecological Sciences in Paris provides administrative support for coordinating the international program. Coordination of activities with other Biosphere Reserves in the region and globally is a particularly important objective.

WILD AND SCENIC RIVERS

I. Definitions

The Wild and Scenic Rivers Act established a national policy that certain selected rivers of the nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in their free-flowing condition and protected for the benefit and enjoyment of present and future generations.

The Act defines a **river** as a flowing body of water or estuary or a section, portion, or tributary thereof, including rivers, streams, runs, kills, rills, and small lakes. The system has three river classifications: wild, scenic, and recreational. A single river or river segment may be divided into different classifications.

Wild river areas Those rivers or sections that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

Scenic river areas Those rivers or sections that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

Recreational river areas Those rivers or sections that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

II. Policy and Program Objectives

The Wild and Scenic Rivers Act provides the most comprehensive legal protection available for the instream values of rivers. It provides strong protection for the corridor on federal lands and limited acquisition and condemnation authority on private lands. The Act protects designated segments and their values from degradation by any federal, federally permitted, or assisted water project, including upstream and downstream projects that might produce adverse impacts on designated corridors. Designation provides a clear federal reserved water right for unappropriated water flowing through federal lands involved, in amounts necessary to protect those values for which the river is designated. It also protects corridors from possible degradation through the land management and development activities of federal land management agencies.

The policy of nondegradation applies to all designated river areas, regardless of classification. Each component must be managed to protect the values for which it was designated, while providing for public recreation and resource uses that do not adversely impact or degrade those values.

NPS Management Policies states:

> Park geologic or ecological sites that best characterize a natural region will be nominated to the Secretary of the Interior for inclusion in the National Registry of Natural Landmarks. As the agency responsible for maintaining the registry, the National Park Service has developed criteria for eligibility (FR 45:81184-93). (4:4)

The objective of reviewing rivers on federal lands through ongoing land management planning processes is to clarify and strengthen protection for eligible rivers on federal lands. Rivers found eligible can be added to the Wild and Scenic Rivers System through this process at greatly reduced time and cost.

III. Authorities

Authorities for designation and protection of Wild and Scenic Rivers include: the Wild and Scenic Rivers Act of 1968 (as amended); the Presidential Directive to All Federal Agencies (August 2, 1979); and the National Wild and Scenic Rivers System: Final Revised Guidelines for Eligibility, Classification and Management of River Areas (jointly prepared by the Departments of Interior and Agriculture and published in 47 FR 39454.

IV. Relationship to Other Guidance

See the National Wild and Scenic Rivers System; Final Revised Guidelines; Procedures for Evaluating Rivers for Wild and Scenic River Status within the National Park System, NPS, 1989; and Special Directive 90-4, Determination of Rivers on National Park System Lands which are eligible for National Wild and Scenic Rivers System Designation. In this Guideline, see Chapter 2, Freshwater Resources Management.

V. Program Guidance

A. Selection Criteria

A wild, scenic, or recreational river area eligible to be included in the system is a free-flowing stream and the related adjacent land area possessing one or more outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values. Every wild, scenic, or recreational river in its free-flowing condition, or upon restoration to this condition, must be considered eligible for inclusion in the National System.

The determination of whether a river area contains outstandingly remarkable values is a professional judgment on the part of the study team and is documented in the study. The study team should consult with outside experts and documents in making these determinations (e.g., The Nature Conservancy biologists, statewide river assessments, Nationwide Whitewater Inventory). There are no specific requirements concerning the length or flow of a river segment. The fact that

a river segment may flow between large impoundments will not necessarily preclude its designation. Rivers in or near urban areas that possess outstandingly remarkable values may qualify. Only one such value is needed for eligibility.

B. Designation Procedure

There are two methods for adding a river to the National Wild and Scenic Rivers System. The first method is by an act of Congress to designate a river directly or following a Congressionally mandated study and positive recommendation by a study team for designation. The second method is for the Secretary of the Interior, upon application of a governor, to add a state designated river to the National System.

Studies are initiated by the Congress under Section 5(a) of the Act, or by a federal land management agency as part of its ongoing land management planning process under Section 5(d). Federal agencies are urged to review and evaluate all rivers on their lands. However, agencies are **required** to review Nationwide Inventory Rivers. Agencies should also take into consideration rivers identified in statewide river assessments. If a river is found eligible, it should be managed in accordance with established Wild and Scenic River Management Guidelines until a suitability analysis is completed and, if found suitable and recommended to Congress for designation, until Congress acts on the proposal.

See Roles and Responsibilities, below, for further details of the designation procedure.

C. Relationship to NPS Planning

National Wild, Scenic, or Recreational River designation provides clear and strong legal protection to a river and its immediate river corridor environment and fully complements park objectives and other special designations such as Wilderness. In cases where a river or section is also within a National Wilderness Area or a National Park System unit and a conflict between the protective provisions of these acts arises, the more restrictive protection applies.

Designation can protect park resources from certain external threats and adverse impacts from upstream or downstream water projects. For example, it would prohibit blockage or diversion of flows that would adversely impact aquatic organisms within the park or create barriers to fish and wildlife populations migrating to and from the park if these are identified as values for which the river was designated.

Wilderness designation generally provides stronger protection from development and use over a wider corridor and this protection would remain unchanged on river corridors designated within a Wilderness Area.

A 1921 amendment to the Federal Water Power Act prohibits water projects within National Park System units. While this provision protects most areas, there are some that have been added to

the park system with prior authorized water projects. Also, current estimates indicate that there are about 260 dams within the National Park System and it is possible that the water projects connected with these could be expanded under prior Congressional provisions. Wild and Scenic River designation could clarify protection in these situations by prohibiting the construction of new projects or the expansion of existing ones.

When the NPS is assigned management responsibility for a National Wild and Scenic River which constitutes a new unit of the National Park System, a general management plan and statement for management must be prepared. If a river is designated within an existing unit, the existing GMP is amended to address the new status of the river. All plans, including resource management plans, which tier off the GMP, must recognize the river designation in any management prescription adopted for the river and its immediate environment.

D. Relationship to Other Designations

Wild and Scenic Rivers administered by the NPS are automatically units of the National Park System. Where Wild and Scenic River designation occurs in an existing park, it represents an overlay on National Park System status. It may also overlay a Wilderness designation or vice versa.

E. Management

Scientific research in river corridors included in the national system is encouraged so long as it does not negatively impact on the resource or the values that caused the river's inclusion in the national system. Resource management practices must be compatible with preservation of wild and scenic river values.

Interpretive, educational, and publicity related activities are consistent with the purposes of the Wild and Scenic River Act. The availability, location, and regulations on the use of wild and scenic river areas should be made widely known to the public to promote their enjoyment without harming the river's integrity. In planning for interpretive activities, special consideration should be given to highlighting the river's outstanding and significant values. Recreational uses which do not adversely impact the values for which a river was designated should be encouraged.

The park may provide basic facilities to help control user impacts on the resource. Wild river areas should contain only basic facilities in keeping with the essentially primitive nature of the area. If basic facilities are necessary, they should generally be located at access points and/or at a sufficient distance from the river bank to minimize their intrusive impact. In scenic and recreational river areas, simple facilities are appropriate so long as they are judiciously located to protect the values of popular areas from the impacts of public use.

The park must ensure protection of wild and scenic river values as part of its overall management responsibility. Allocation of funds for park operations should ensure that adequate personnel and

funds are available for protection, inventory, monitoring, and management of wild and scenic river resources.

VI. Roles and Responsibilities

A. Park

Superintendents, with assistance from regional offices, screen all rivers within their areas to identify and evaluate potential wild and scenic river segments. These river segments include but should not be limited to those river segments listed on the Nationwide Rivers Inventory, which is published and maintained by the regional offices and the Washington Office, Recreation Resources Assistance Division. Superintendents conduct river assessments and provide interim management protection in accordance with Special Directive 90-4 and Procedures for Evaluating Rivers for Wild and Scenic River Status within the National Park System. The purposes of these assessments are (1) to determine and document which river corridor segments contain one or more "outstandingly remarkable" values that would qualify as eligible for Wild and Scenic River designation and (2) to determine the appropriate classification (wild, scenic, or recreational) for each eligible river segment.

B. Region

Regional offices coordinate with other federal agencies and states and provide technical assistance and guidance to superintendents on determining what rivers should be assessed in the resource management planning process, and on the conduct of river eligibility assessments. When the (amended) GMP calls for Congressional designation, regional offices are responsible, with assistance from the parks, for preparing environmental impact statements and formulating legislative proposals to add river segments to the National Wild and Scenic Rivers System. Regional offices submit the river assessments, legislative proposal, and EIS to the Washington Office for review and approval. Upon approval, regions print and distribute the river plan/legislative EIS for review and comment in compliance with NEPA regulations. After the draft comment period, regions revise as necessary and prepare the final river plan/legislative EIS in cooperation with the superintendent and submit it to the Washington Office for transmittal to the President and the Congress.

C. Washington Office

The **Associate Director, Planning and Development**, in cooperation with the Associate Director, Natural Resources, the regional offices, and selected field units, drafts, distributes for comment, revises, and finalizes procedures and guidance for review and assessment of potential wild and scenic rivers within parks as part of the resource management plans. The Associate Director, Planning and Development, submits the draft river EIS and legislative proposal through the Director and the Assistant Secretary to the Secretary and upon approval distributes it to federal agency heads for review and comment. The NPS **Legislative and Congressional Affairs Office** prepares proposed legislation for river designations recommended in the resource management

plans. The Associate Director, Planning and Development, prepares final transmittal documents to OMB, the President, and the Congress.

NATIONAL LONG-DISTANCE TRAILS

I. Definitions

Four types of national trails are defined in the National Trails System Act. The first two categories can only be established by act of Congress, and are to be administered by federal agencies, although part or all of their land base may be owned and managed by others.

National Scenic Trails are over 100 miles long, and are "so located as to provide for maximum outdoor recreation potential, and for the conservation and enjoyment of the nationally significant scenic, historic, natural, or cultural qualities of the areas through which such trails may pass."

National Historic Trails are over 100 miles long, and "follow as closely as possible and practicable the original trails or routes of travel of national historic significance." Their purpose is the identification and protection of the historic route and its remnants and artifacts for public use and enjoyment.

National Recreation Trails are of any length and are accepted in the system upon approval by the Secretary of the Interior or the Secretary of Agriculture, to "provide a variety of outdoor recreation in or reasonably accessible to urban areas."

Connecting or side trails provide additional public access to the above three types of trails, or connections between such trails.

II. Policy and Program Objectives

Little policy guidance is currently available other than the language of the National Trails System Act itself. The objectives of the Act are to establish a national system of trails lying not only on federal land, but also crossing state and local public lands, as well as private holdings. The Appalachian, Natchez Trace, and Pacific Crest National Scenic Trails lie in large part within protected federal corridors. For those trails assigned to it, the NPS management role is one of coordination, encouragement, designation of segments meeting eligibility criteria, and land protection, where allowed by law. More than 25,000 miles of the 16 Congressionally authorized National Trails (as of 1990) pass through or lie adjacent to 56 NPS units. Within these units, the long-distance trails are frequently established and maintained by volunteer organizations. Three of these trails themselves are NPS units.

III. Authorities

The primary authority is the National Trails System Act, 1968, as amended.

IV. Relationship to Other Guidance

See NPS-2, the Planning Process guideline; NPS-6, the Interpretation and Visitor Services guideline; NPS-7, the Volunteers in Parks guideline; NPS-9, the Law Enforcement guideline; NPS-20, the Federal Assistance and Interagency Agreement guideline; NPS-25, the Land Acquisition Policy Implementation guideline; NPS-28, the Cultural Resources Management guideline; NPS-34, the Land and Water Conservation Fund Grants Manual; and NPS-52, the NPS Traffic Control Sign System guideline.

V. Program Guidance

Congress identifies National Scenic and Historic Trails to be studied for inclusion in the National Trails System. Based on the recommendations of the feasibility study, selected trails are authorized for establishment and assigned to a relevant federal agency. Nominations for recreation and connecting trails can be made at the local and state level, as well as by federal agencies, and are approved by Secretarial signature.

Once authorized and assigned to a regional (or project) office, each trail's administrative needs are addressed in cooperation with an advisory council appointed by the appropriate departmental secretary. Land protection authority in the Act varies from trail to trail, ranging from full condemnation powers to a prohibition on ever accepting donated land. Management of nonfederal segments of these trails by state and local authorities must occur at no expense to the U.S. government, other than grants from the Land and Water Conservation Fund.

Other federal administrative responsibilities include support of volunteer efforts, management planning, interagency coordination, mapping and data collection, resource inventories, compliance, land transfers, interpretation, publicity, marking, route monitoring, and protection of rights-of-way in which there is a federal interest.

VI. Roles and Responsibilities

Management for the 16 Congressionally authorized trails (as of 1990) is divided among the U.S. Forest Service (4), the Bureau of Land Management (1), and the NPS (11). Of these last, the Appalachian Trail is managed from a project office in Harpers Ferry, WV, under the **Washington Office.** The Washington Office also coordinates feasibility and management planning. The 10 other trails for which NPS has management responsibility are assigned to various **regional offices.** Often parts of these extended trails lie outside the regions administering them.

OTHER DESIGNATIONS

The following special designations affect only a few NPS areas or are more fully discussed in another section of this Guideline. Therefore, they receive brief treatment here.

I. National Marine Sanctuaries

These are areas of coastal and ocean waters, the Great Lakes and their connecting waters, and submerged lands over which the U.S. exercises jurisdiction that the Secretary of Commerce has designated because of their national significance for conservation, recreation, or ecological, historical, research, educational, or aesthetic qualities. Designation occurs after a 30-month process including development of an EIS, a management plan, a prospectus for Congress, and site regulations. After designation Congress has a 45-day period in which to concur or reject.

The National Oceanic and Atmospheric Administration administers these areas with its own personnel or cooperatively with other agencies. The NPS assists with interpretation and law enforcement in some National Marine Sanctuaries adjacent to NPS areas. Sanctuary boundaries usually, though not always, extend to the high-tide line of land areas and may overlap NPS boundaries.

II. RAMSAR Sites

These are officially titled Wetlands of International Importance Especially as Waterfowl Habitat. The Convention providing for listing of these sites was concluded at Ramsar, Iran, February 2, 1971. The United States became a full party to the Convention on April 18, 1987. One aspect of the Convention is its requirement that parties identify wetlands of international importance and list them under the auspices of the Convention. The listing serves to highlight the values of these sites but affects neither the management regime for these areas nor resource use within them. Contracting parties to the Convention are to formulate and implement their planning so as to promote the conservation of the wetlands included in the List. The Convention specifies the criteria for inclusion in the List. Everglades National Park was among the first six sites accepted on the List. Delisting by the Conference of Parties is possible if ecological or hydrological characteristics of a site deteriorate because of human interference.

III. Class I and Class II Areas, Clean Air Act

In this Guideline, see Chapter 2, Air Resources Management.

IV. Critical Habitat

In this Guideline, see Chapter 2, Endangered, Threatened, and Rare Species Management.

SUMMARY CHART OF SPECIAL DESIGNATION AREAS

Designation	Type of System	Year Est.	Application	Principal Uses	Coordinating Entity	Comments
Research Natural Area	National	1966	Usually small parts of units; NPS designates	Observation, monitoring, and research. Principal sites for acquiring benchmark environmental and ecological information.	Federal Committee on Ecological Reserves (inactive)	An old but underutilized concept on NPS lands.
Experimental Research Area	NPS	1974	Usually small parts of units; NPS designates	Experimental research involving disturbance of natural ecosystems.	NPS	This designation is a new concept for NPS lands, although manipulative research occasionally has been conducted to obtain information needed for management.
National Natural Landmark	National	1963	Usually small parts of units; Secretary designates.	Variable. Major emphasis on protection of "nationally significant" natural features.	NPS	Designation has not heretofore been applied to National Park System, although they do exist in parks where designation occurred prior to park establishment.
Wilderness Area	National	1964	Parts of units; Congress designates.	Primitive recreation, protection of natural resources, and atmosphere of solitude.	Various agencies	Addition to National Wilderness Preservation System legally restricts most development and many types of land uses and protects in perpetuity. Designations to the National Wilderness System for NPS areas are substantially complete, except in newly authorized units.

SUMMARY CHART OF SPECIAL DESIGNATION AREAS

Designation	Type of System	Year Est.	Application	Principal Uses	Coordinating Entity	Comments
Wild, Scenic, and Recreational Rivers	National	1968	Usually parts of units; Congress designates.	Recreation and protection of scenic, recreational, geologic, fish, wildlife, historic, cultural, scientific, or other similar values.	NPS, USFS, BLM, FWS, States	Gives the strongest legal protection for instream values of rivers and provides strong protection for the immediate corridor or environs on federal lands.
National Trail	National	1968	Parts of units: Congress designates National Scenic and National Historic Trails; Secretary of Interior or Agriculture approves National Recreation, connecting, and side trails.	Recreation and protection of scenic, historic, natural, cultural, and recreational values.	NPS, USFS, BLM, States	A varied and expanding system with complex jurisdictional and management arrangements.

SUMMARY CHART OF SPECIAL DESIGNATION AREAS

Designation	Type of System	Year Est.	Application	Principal Uses	Coordinating Entity	Comments
World Heritage Site	International	1973	Entire units or parts of units; World Heritage Committee designates.	Natural and cultural sites recognized as of "outstanding universal value" and added to the World Heritage List to encourage their continued preservation and public appreciation.	Assistant Secretary coordinates program in U.S. Coordinated worldwide by the World Heritage Committee, supported by a Secretariat in Paris at UNESCO headquarters.	A few World Heritage Sites are also Biosphere Reserves. To date most in U.S. are on NPS lands.
Biosphere Reserve	International	1976	Entire units or multiple units; UNESCO designates.	Landscapes and seascapes with outstanding international suitability for conserving biological diversity, long-term ecological monitoring, interdisciplinary and cooperative research, environmental education, training, and demonstration.	U.S. Biosphere Reserve Coordinating Committee under the U.S. MAB National Committee. UNESCO's International Coordinating Council guides MAB worldwide, supported by the MAB Secretariat at UNESCO headquarters in Paris.	In the U.S. multiple sites under different administering entities in the same biome are increasingly being linked to form biosphere reserves.

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ENVIRONMENTAL COMPLIANCE

Environmental compliance in the National Park Service encompasses the mandates of the National Environmental Policy Act of 1969 (NEPA) and all other federal environmental laws that require evaluation, documentation and disclosure, and public involvement, including the Endangered Species Act, Clean Water Act, Executive Orders on Floodplains and Wetlands, Coastal Zone Management Act, and others.

NEPA itself is widely viewed as landmark legislation because it declared a national environmental policy, created a formal, legal process for the integration of environmental values into federal decision-making, and provided an umbrella under which compliance with several environmental laws can be integrated.

The natural resource policy direction of NEPA, found in Section 101 of the Act, includes the promotion of "efforts which will prevent or eliminate damage to the environment and to the biosphere" and will "enrich the understanding of ecological systems and ecological resources of the nation." All federal agencies are to use all practicable means to "fulfill the responsibilities of each generation as trustee of the environment for succeeding generations," and to "maintain, whenever possible, an environment which supports diversity..." The Act further discusses the role of research, studies, and investigations in forming the information base from which the cause and effect of environmental changes could be analyzed and monitored.

Although NEPA does not require a particular outcome of the decision-making process, it does require federal agencies to take a hard look at the environmental effects based upon the best information available. NEPA, through section 102, and the accompanying guidelines of the Council on Environmental Quality (CEQ)(40 CFR 1500-1508) set forth mandatory legal procedures all federal agencies must follow. It is important that all NPS professionals, including natural resource specialists, understand the requirements and their application, in full recognition that environmental documents are legally reviewable in a court of law.

This section of NPS-77 is a brief explanation of the NPS compliance requirements. More detailed guidance is contained in NPS-12, the Environmental Compliance guideline.

POLICY AND PROGRAM OBJECTIVES

The goals and policies expressed in NEPA clearly complement and enhance the essential resource protection mandates of the National Park Service. NEPA clearly intended for environmental values to be given full and professional consideration in federal decisions. Environmental compliance in the NPS is done not only to meet the requirements of the law, but also to ensure that decisions affecting natural resources are the best, most informed decisions possible as was intended by NEPA's policy language.

All natural resource management and scientific activities are subject to environmental analysis under NEPA. Resource planning documents (resource management plans, vegetation management plans, water resource management plans, fire management plans), species control programs or species restorations, research that requires sampling or manipulation, supplemental feeding, and similar actions are all subject to scrutiny and must show that appropriate environmental compliance has been completed and that the required analyses have been undertaken.

In general, to meet the test of "appropriateness," such programs must comply with the regulations and guidance of the Council on Environmental Quality (CEQ), the Department of the Interior Manual, and NPS-12, the Environmental Compliance guideline.

The NPS also recognizes that most of the decisions made through various compliance processes have major implications for the long-term viability of park resources and the National Park System's representation of biological diversity, especially when an environmental impact statement is involved.

Additionally, the results of any single park's or region's compliance efforts represent, and may possibly set, a significant precedent for the entire National Park System.

Participation by the NPS in the environmental compliance processes of other agencies and jurisdictions is an important managerial tool. It can provide the NPS with information that will allow the Service to respond to possible external threats to a park well before they occur. State and local governments often have environmental documentation requirements that are similar to NEPA's. Parks are encouraged to participate as cooperating agencies (40 CFR 1501.6) in the environmental compliance process to the fullest extent possible when the NPS resources may be affected, and as set forth in the CEQ regulations.

Each park should have at least one individual who is familiar with NEPA and other environmental laws. Additionally, parks are encouraged to have compliance committees, usually comprised of a representative from each division, to coordinate projects and compliance needs within the park. Some parks or regions may have established procedures to assist the park compliance coordinator or committee in meeting compliance requirements.

To the extent feasible, parks should maintain a data base of environmental documentation, including dates and brief descriptions of projects for which the documentation was done. Compliance documentation older than 5 years should not be relied upon as documentation for new projects or proposals.

AUTHORITIES

In addition to the general authorities discussed in Chapter 1, the principal authorities for environmental compliance include the National Environmental Policy Act of 1969; the Endangered Species Act; the Clean Water Act; the Coastal Zone Management Act; Executive Order 11988, Floodplain Management; and Executive Order 11990, Protection of Wetlands.

RELATIONSHIP TO OTHER GUIDANCE

Guidelines include 40 CFR 1500-1508 and NPS-12, the Environmental Compliance guideline. In this Guideline, many of the individual sections include guidance on NEPA-related or other environmental compliance procedures. In the event of a discrepancy between guidance in other sections of NPS-77 and that in NPS-12, guidance in NPS-12 from environmental compliance supersedes.

PROGRAM GUIDANCE

NEPA documents usually combine compliance with NEPA, the Endangered Species Act, Coastal Zone Management Act consistency requirements, and related laws. This approach is encouraged. However, only NEPA requirements are discussed below.

Section 102 of NEPA sets forth a procedural means for compliance. Federal agencies are required to "utilize a systematic, interdisciplinary approach" to ensure the integrated use of information in federal decision-making in situations that may have significant effects on the environment. Agencies should "include in every recommendation or report on proposals for legislation and other major federal actions significantly affecting the environment a detailed statement by the responsible official" outlining the environmental impacts, identifying unavoidable adverse environmental impacts, describing alternatives to the proposed action, and describing irreversible and irretrievable resource commitments. This statement should "ensure that presently unquantified environmental amenities and values may be given appropriate consideration in decision making...."

The CEQ regulations further define the requirements for compliance with NEPA. Each proposed project must be evaluated at the earliest possible opportunity for potential environmental effects. In this way, proposals that may have entirely unacceptable impacts can be eliminated before any important commitments are made, or, a proposal can be modified to become more acceptable.

All actions require some level of evaluation under NEPA. Actions that are routine and have minimal or no potential impacts are excused from in-depth analysis under most circumstances. These are usually referred to as being "categorically excluded" because they have no potential for significant environmental effects. All projects determined to be categorically excluded should be documented by a memo to the files signed by the park superintendent.

However, it must be cautioned that a categorical exclusion will not apply if the action

- adversely affects public health and safety or critical or geographically unique characteristics,
- is highly controversial,

- is precedent-setting,
- adversely affects properties on or eligible for the National Register of Historic Places,
- potentially affects a listed or proposed to be listed species under the Endangered Species Act, or
- potentially violates other laws when implemented.

A careful check of the NPS list of categorical exclusions and (see NPS-12) Departmental exceptions to these must be made by the park. The park should also consult with the regional environmental coordinator for assistance in determining which kind of environmental documentation is most appropriate.

If an action is not clearly categorically excluded, then it may require an environmental assessment (EA) or an environmental impact statement (EIS). The purpose of an environmental assessment is to establish whether or not an action may have significant effects on the environment. All feasible alternatives, including the "no action" alternative should be examined. Before undertaking any NEPA documentation, careful review must be given to the potential action relative to the CEQ criteria for "significance" (see CEQ guidelines). Additionally, NPS-12 contains a list of NPS actions for which EISs are required.

If all potentially significant effects can be mitigated, then the outcome of an environmental assessment may be a "Finding of No Significant Impact," or FONSI. The FONSI is legally a separate document from the EA, and can be reviewed by a court.

See NPS-12 for a more complete discussion about determining if an effect may be significant, and for more information about environmental assessments and EISs.

ROLES AND RESPONSIBILITIES

I. Park

Superintendents are responsible for knowing and implementing the environmental protection laws applicable to the NPS. They must assure that all park proposals are in compliance with NEPA.

Resource managers and scientists should be familiar with environmental protection laws as an important component of planning and implementing resource management and research activities within parks.

II. Region

Regional Directors are delegated the authority to approve most site-specific EISs and are responsible for approval of environmental assessments. **Only** Regional Directors are to sign a Finding of No Significant Impact (FONSI). The authority to approve an environmental assessment can be delegated to superintendents if a Regional Director so desires. Regional Directors also can accept or reject requests for the NPS to be a cooperating or joint lead agency on another agency's EIS.

Regional environmental coordinators have oversight responsibility for all environmental compliance activities within a given region. They usually are the point of contact with the Washington Office on significant environmental issues. They serve as a resource to other NPS professionals for understanding the various environmental requirements under which the Service operates.

III. Washington Office

The **Director** retains signature and approval authority for programmatic environmental impact statements (i.e., those that are done for proposals of nationwide application such as the statement prepared for the integrated pest management program, the wild and scenic rivers program, and general management plans). The Director is also responsible for signing findings relative to floodplains or wetlands. While Regional Directors are delegated authority to approve other site-specific EISs, the Director may assume signature authority for any EIS that is unusually controversial or that involves major policy issues. The **Environmental Quality Division** reviews all NPS EISs and EISs for which the NPS is a joint lead agency, and gives the approval to print for distribution to the public.

IV. Systemwide

Contracting officers in parks, regions, and the Washington Office (including the Denver Service Center) are responsible for including in contracts and specifications all mitigating measures identified in an environmental document for the proposed action when construction is part of the project. Contracting officers are also responsible for assuring that NEPA requirements are satisfied for all change orders.

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LAND ACQUISITION AND PROTECTION

This section describes the purpose and intent of park land protection planning, and identifies considerations for the resource manager in this process.

DEFINITIONS

Fee The terms "fee," "fee simple," and "fee simple absolute" are often used interchangeably to describe ownership of all rights in land, free of any conditions or restrictions. Most land in the United States is subject to some limits of governmental authority to impose taxes or regulations for public health and safety. Properties are also often subject to some type of mortgage or right of way for utilities. The National Park Service usually uses the term "fee" to describe all of the interests owned by the current owner, even if some rights have previously been conveyed to others.

Easement An easement is an interest in property that affects one or more rights of ownership but not all of them. Positive ease-ments convey a right to use property; negative easements limit how the land will be used. Positive and negative elements may be combined in one easement. An easement is thus an interest that is "less than fee."

POLICY AND PROGRAM OBJECTIVES

The NPS Management Policies states:

> Land protection plans will be developed and periodically reviewed and updated for each park containing nonfederal lands or interests [including minerals] that may be subject to acquisition [by NPS]. Land acquisition will be guided by a park's land protection plan. (3:1)

Detailed instructions for preparing park land protection plans were published in the Federal Register on May 11, 1983 (48 FR 21121-21130). The plans respond to Departmental policies on use of the Land and Water Conservation Fund (47 FR 19784). Land protection plans are used to determine what land or interests need to be in federal ownership, and what means other than federal acquisition are available to protect resources. They can also serve as a tool to inform landowners about the NPS's intention to buy land or protect it through other means, and to encourage cooperation with states, local governments, other federal agencies, and the private sector.

AUTHORITIES

Primary authorities for park land protection planning are the General Authorities Act and individual park enabling legislation.

RELATIONSHIP TO OTHER GUIDANCE

NPS-2, the Planning Process guideline, provides detailed guidance on the basic procedures for park planning. NPS-53, the Special Park Uses guideline, provides guidance on rights of way. Land protection plan instructions are found in 48 FR 21121-21130. (See also NPS-66, the Minerals Management guideline.) In this Guideline, see Chapter 2, Hazardous Waste Management; Chapter 3, Rights of Way and Easements, Minerals Management; and Chapter 4, Resource Management Plan.

PROGRAM GUIDANCE

Key steps in preparing a land protection plan are:

1. defining issues,
2. describing current and potential uses of nonfederal lands,
3. determining what private uses are compatible or incompatible with park purposes,
4. assessing alternative protection measures,
5. establishing priorities for acquisition, and
6. discussing interim protection measures.

Land protection plans focus on land or interests within park boundaries that are not federally owned and managed by the NPS. Issues related to uses of adjacent lands may be discussed in a land protection plan, but detailed recommendations for addressing these issues should be developed in the general management plan, special studies of related lands and potential boundary adjustments, or resource management plans.

Natural resource management issues are especially important in defining what private uses are compatible with purposes of the park. Requirements for fish and wildlife habitat, protection of threatened or endangered species, control of exotic species, vegetation management, access for inventories or resource studies, air and water quality maintenance, public use, natural or prescribed fire, or other management actions may conflict with private ownership and use of land within park boundaries. On the other hand, some private uses for farming, ranching, occupancy of historic houses, or other activities may be consistent with park purposes and part of the resource that needs to be protected.

I. Protection Techniques

Land protection plans consider a range of alternative methods for carrying out purposes of the park. The land protection plan distinguishes between the method of protection, interests to be acquired, and methods of acquisition. Alternatives may include:

1. cooperation directly with landowners or with state and local agencies that have regulatory authority over zoning, subdivision, air and water quality, etc. (NPS also can regulate certain activities, including mineral exploration and development, and can cooperate with other federal regulatory agencies, such as EPA, OSM, Corps of Engineers, and the Coast Guard);

2. acquisition of less-than-fee interests such as easements or rights of way; and

3. acquisition of fee interests, possibly with arrangements for certain private rights to be reserved for a specified term.

When fee or less-than-fee interests are proposed for acquisition, land protection plans explain various methods of acquisition including donation, purchase with appropriated or donated funds, exchange, transfer from another federal agency, withdrawal from the public domain, and condemnation. A more detailed discussion of the advantages and disadvantages of these protection methods appears in the land protection plan instructions (48 FR 21121-21130).

Ownership of fee interests generally provides the greatest flexibility to manage resources and provide for public use and enjoyment. Easements are most often appropriate where some, but not all, reasonable private uses are compatible with park purposes. Cooperation with local governments in planning and zoning can be helpful in providing interim protection until the necessary interests can be acquired, but does not usually provide the type of long-term protection required to meet park objectives for future generations. Cooperation with local planning and zoning authorities or other federal agencies is often most useful in addressing the potential for development of adjacent lands.

Departmental policies call for identification of the minimum interests necessary to carry out park purposes, and use of cost effective protection techniques. Information about natural resource management objectives and requirements should be considered in the initial planning process, and again when plans are updated every 2 years, to define what are the minimum requirements for ownership of land within park boundaries.

The Regional Land Resources Division is responsible for the execution of the acquisition program. The annual budget submission for the Service's land acquisition program is prepared by the Land Resources Division, WASO, based on information supplied by parks to their respective Regional Land Resources Division.

II. Special Considerations

Many parks contain oil, gas, and other mineral interests that are not in federal ownership. Mineral development is generally not consistent with park purposes, except in certain units where Congress has specifically authorized exploration and development activities to continue. Land protection plans identify nonfederal mineral ownerships, explain legislative directions or constraints, discuss options and applicable regulations, and recommend what interests may need to be acquired. (See further, Chapter 3, Minerals Management.)

The Constitution guarantees that private property cannot be taken for public purposes without just compensation. Land protection plans do not diminish the rights of landowners and cannot prohibit the reasonable use of private property. For example, land protection plans recognize that the owners of oil, gas, or mineral interests have certain rights that the NPS may intend to acquire. These rights may be subject to reasonable regulation prior to acquisition. Planning documents do not prohibit exploration or development, but discuss what regulatory tools may be available to provide interim protection until the necessary interests can be acquired.

Executive Order 12630 requires the preparation of a takings impact assessment prior to any federal action that may involve an unanticipated taking of private property. The NPS has recommended that planning, including land protection plans, be considered a categorical exception to the requirements for these assessments.

Recommendations for acquiring land that may include hazardous or toxic waste must include consideration of the potential liability to the federal government for cleaning up those wastes. Departmental guidelines for land acquisition establish procedures for hazardous materials surveys. In most instances, the NPS will propose that any hazardous or toxic waste problems be resolved by the current owner prior to federal acquisition.

ROLES AND RESPONSIBILITIES

I. Park

The **superintendent** has primary responsibility for preparing the statement for management, outline of planning requirements, land protection plan, resource management plan, and most other implementing plans.

General management plans and development concept plans are often produced by the Denver Service Center, under direction from the regional office. Land protection plans (along with general management plans, development concept plans, resource management plans, and some other planning documents) are reviewed for consistency with the NPS policies by the regional office and the Washington Office, and then approved by the Regional Director. The Park Planning and Protection Division in the Washington Office coordinates Washington Office policy reviews.

Resource managers should participate throughout the park planning process to ensure that resource management issues, objectives, and information are highlighted as necessary in all planning documents, including the land protection plan, as they are prepared by the park staff or by planning teams from the region or the Denver Service Center. By participating as members of planning teams, or by reviewing draft plans, resource managers can help assure that their program concerns are reflected in the final decisions on park protection and management.

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EMERGENCY MANAGEMENT

By their nature, major emergencies such as wildland fires, structural fires, severe storms, and hazardous waste spills can have a significant impact on the natural resources of a park. Failure to anticipate potential disasters or to provide adequate response may result in a public outcry and possibly unnecessary damage or loss of the resources of the park. Prior planning should anticipate these emergencies as much as possible and outline preventive actions to take in advance of the emergency. The purpose of this section is to provide guidance to superintendents and resource managers on avoiding or minimizing impacts on park natural resources resulting from emergencies.

DEFINITIONS

Unnecessary damage and loss Elimination of park resources or damage or disruption to ecosystems threatening their continuation that could have been controlled, minimized, or mitigated; for example, loss of critical habitat of threatened or endangered species.

POLICY AND PROGRAM OBJECTIVES

The NPS Management Policies states:

> The National Park Service will develop a program of emergency preparedness in accordance with the Federal Civil Defense Act..., National Security Decision Directive 259..., departmental policy, and other considerations at the Washington, region, and park levels. The purpose of the program will be to maximize visitor and employee safety and the protection of property. This program will include a systematic method for alerting visitors to potential disasters and evacuation procedures....Each park superintendent will develop and maintain an emergency operations plan to ensure an effective response to all types of emergencies that can be reasonably anticipated. (8:6)

Natural resources should be considered when developing the park's emergency plan in order to avoid unnecessary damage and loss of these resources. The comprehensive emergency plan (EP) must be developed in accordance with NPS-50, the Loss Control Management guideline. In preparing this plan, the park must make a risk analysis and identify the potential impacts that various types of emergencies might have on the natural resources of the park. The EP should identify the necessary actions to provide a controlled reaction and response adequate to prevent further damage or loss to the resource, while taking the necessary steps to protect human health and safety.

RELATIONSHIP TO OTHER GUIDANCE

Additional guidance on emergency management procedures is provided in NPS-50, the Loss Control Management guideline; NPS-18, the Fire Management guideline; NPS-9, the Law Enforcement

guideline; NPS-28, the Cultural Resources Management guideline; and NPS-51, the Emergency Medical Services guideline. See also in this Guideline, Chapter 2, Hazardous Waste Management.

PROGRAM GUIDANCE

A comprehensive EP should direct the park staff on how to limit the extent or impact of the emergency and how operations can be returned to normal. It is important in emergency planning that all potential threats be identified and evaluated in terms of their occurrence and impacts on natural resources. Only in that way can the EP focus on those emergencies in a manner that may limit or prevent the occurrence of resource damage and assure preparedness on the part of the park staff.

The variety of threats and hazards that can cause emergencies in parks include, but are not limited to, the following:

- **Environmental hazards:** debris flow, wildfire, hurri-cane, tornado, earthquake, flood, volcanic eruptions.

- **Human activities:** human-caused fire; accidents (haz-ardous waste spills, industrial accidents, failure of dams, airplane crashes); accidents involving broken fuel pipelines.

A comprehensive emergency plan should describe how and by whom decisions are to be made in order to maintain control over the emergency. The plan presents a step by step process for dealing with emergencies. Adequate manpower and equipment should be identified and available to be called upon, if needed. The EP should outline responsibilities and contain a list of aid from non-NPS sources.

In addition to planning the response during the emergency, the associated action plans should identify recovery activities to mitigate the damage to park natural resources that occurred as a result of the emergency; e.g., fire management plans should include actions to assure that suppression lines are rehabilitated. The plan should prioritize actions to prevent the greatest damage to resources while maintaining public safety.

ROLES AND RESPONSIBILITIES

The **superintendent** is responsible for the preparation, approval, and implementation of the emergency plan and adequate action plans. **Regional offices** are responsible for review of park operations plans and associated action plans (fire management plans, hazardous waste management plans, etc.).

CHAPTER FIVE: PROGRAM ADMINISTRATION AND MANAGEMENT

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RESEARCH ADMINISTRATION

This section provides guidance on research program design and management, the role of cooperative park study units (CPSUs) in NPS research, and research grade/grants grade evaluation.

DEFINITIONS

Contracting Officers Technical Representative (COTR) The technical liaison between the contractor and the contracting officer. The COTR must have an intimate knowledge of the contract requirements and the technical expertise necessary to assess the contractor's performance and recommend acceptance or rejection of the deliverables.

Cooperative Park Studies Unit (CPSU) Established by the National Park Service in cooperation with an institution of higher learning to assist the NPS in accomplishing a variety of public purposes of support or stimulation authorized by Federal statute. A CPSU has a resident scientist who has been designated Unit Leader and is responsible for administering the operations of the unit. This person is usually a National Park Service scientist, but in some cases is a university faculty member, a portion of whose salary (at least 25%) is provided by the Service.

Research Research is investigation aimed at the discovery and interpretation of facts, the revision of accepted theories in light of new facts, or the development of practical applications of such new or revised theories. Through systematic research the NPS better understands the natural resources and processes it manages. National Park System units serve as vital laboratories for non-destructive research that provides NPS managers, the scientific community, and the general public with greater insight into methods for the long-term management and protection of natural resources.

Research Proposal A written offer to conduct a scientific investigation of a stated topic. Research proposals must contain a statement of the scientific question; identification of the hypotheses to be tested (where appropriate); presentation of methods to be used; the character, and, where suitable, the potential applicability of results to be expected; a budget that shows salary and benefits, equipment, supplies, travel, overhead, and other projected costs; a bibliography of literature; and resumes of the principal investigators proposing to conduct the investigation.

POLICY AND PROGRAM OBJECTIVES

The NPS Management Policies states:

> A program of natural and social science research will be conducted to support NPS staff in carrying out the mission of the National Park Service by providing an accurate scientific basis for planning, development, and management decisions.

> The science program will be focused on applied research necessary to direct management actions in pursuit of park objectives as stated in legislation and planning documents. This research may involve the pursuit of new facts and principles when problems arise for which no current solutions exist or when the collection of baseline inventory data must precede the identification of appropriate management actions. Basic research may also be necessary to correctly interpret resources whose functioning and significance are not already known. (4:2-3)
>
> The National Park Service will cooperate with research institutions to establish cooperative park study units (CPSUs) where specialized expertise exists which can be of significant assistance to the Service in conducting research and where the opportunity for research and study in the parks offers the institution an equally significant benefit to its programs.
>
> In recognition of the scientific value of parks as natural laboratories, investigators will be encouraged to use the parks for scientific studies when such use is consistent with NPS policies. Research activities that might disturb resources or visitors, that require the waiver of any regulation, or that involve the collection of specimens may be allowed only pursuant to the terms and conditions of an appropriate permit. Manipulative or destructive research activities generally will not be permitted within parks. Exceptions may be granted if the impacts will be short-lived, the park is the only area where such research can be conducted, the value of the research is greater than the resource impacts, or the research is essential to provide information for resource management. (4:3)

NPS research program objectives are centered on providing both descriptive data and an understanding of ecosystem processes, so that managers will be able to make cogent decisions regarding the preservation, maintenance, and appropriate use of NPS natural and cultural resources. Specific research objectives are identified in the resource management plan of each park or in regional or Servicewide research program plans and fall under the following broad categories:

- obtaining physical, biological, and ecosystem process information needed for management decision-making;
- completing resource base inventory information on all natural and cultural resources of the park;
- developing appropriate systematic collections in support of scientific research;
- establishing appropriate programs for monitoring natural and cultural resources;
- maintaining and managing natural genetic integrity and diversity of park biological resources; and

- coordinating research efforts with owners or managers of adjacent lands to ensure the integrity of complete ecosystems.

AUTHORITIES

In addition to the general authorities discussed in Chapter 1, some park-specific legislation, particularly in a number of recently established areas, directly mandates that research be carried out on specific groups of organisms. The Endangered Species Act mandates that all federal agencies take the steps necessary to protect and assist in the recovery of endangered species occurring on their lands; these steps include research, where needed.

36 CFR states that all research collecting (by other than NPS staff researchers) in NPS areas must be authorized by collecting permits issued by specific parks.

RELATIONSHIP TO OTHER GUIDANCE

Other guidance may be obtained from the authorities above and from NPS-2, the Planning Process guideline; NPS-12, the Environmental Compliance guideline; NPS-18, the Fire Management guideline; NPS-20, the Federal Assistance and Interagency Agreements guideline; NPS-28, the Cultural Resources Management guideline; NPS-32, the Cooperating Associations Policies Standards and guideline; NPS-53, the Special Park Uses guideline; and the NPS Museum Handbook, Part II, Museum Records. In this Guideline, see also Chapter 2, Paleontological Resources Management and Chapter 5, Interagency Agreements, Natural Resources Budget Formulation, Special Use Permits, Publications, and Collections.

PROGRAM GUIDANCE

I. Research Program Design and Management

A. Needs Identification

Ideally, natural and social science research needs should be identified by appropriate park management staff; clarified and focused by discussion with park, CPSU, or regional scientists; and clearly defined in a current park resource management plan. From that plan, lists of prioritized research needs may be developed to meet annual or multiannual calls issued by the regional chief scientist and/or Servicewide program managers as they develop implementation strategies for regional and Servicewide needs.

Variations of this scenario will result when recent findings identify the need for subsequent or further research to clarify or enhance current findings. Research may also elucidate previously unknown resource management/preservation problems in a given area. In such cases, it is necessary to thoroughly analyze and document the need for the indicated research in order to dispel any idea that research is "developing its own agenda" in contrast to established management need priorities.

Occasionally, a unique research opportunity with potential for significant scientific contributions may be implemented prior to another project with a higher documented priority. Projects of lower regional or Servicewide priority may occasionally be implemented ahead of higher priority projects when unique opportunities for cost sharing/saving and/or cooperation exist. It is the responsibility of the appropriate science manager to document such opportunities for concurrence by the appropriate program manager when they occur and to promptly inform or consult with any affected parks, researchers, or research administrators regarding the changes in priority.

B. Research Standards and Conditions

All prospective investigators should be informed by the superintendent as to the standards and conditions of research in NPS units. These include the following:

- Each research study must have a research proposal that includes, at a minimum, the purpose, objectives, and scientific methodology for the study; precise identification of study area; proposed starting and ending dates; provision for reporting of research results; and approval of the plan and any subsequent revisions. (See Exhibit 1 for further details.)

- Studies must be scientifically valid and tested through peer review (regions should develop peer review procedures for NPS-funded research).

- Studies should contribute to the better understanding of park resources and ecosystems and their use and management.

- Specimen collection and destructive sampling will be allowed only if it results in information that provides for increased protection of resources or scientific knowledge not otherwise available, and all specimens intended to be retained rather than destroyed remain the property of the NPS, regardless of where they are stored.

- Specimen collection must be conducted by qualified representatives of institutions or agencies.

- Specimens retained for display or the permanent collection must bear official NPS museum labels and be registered in a NPS catalog system in accordance with the NPS Museum Handbook, Part II, Museum Records.

- Except for visitor related (i.e., social science) studies or those that cannot be done elsewhere, research in areas of concentrated visitor use is generally not permitted, especially if it involves collection, capturing, or marking of natural resources.

- Motor vehicles, mechanized transportation, or power equipment generally are not permitted beyond roadways, especially in wilderness areas, unless specifically approved by the superintendent.

- Research personnel are expected to obey all park regulations not specifically excepted in writing by the superintendent.

- Specific permits are needed and include those required by other agencies before research can be done in a park; e.g., endangered and threatened species permit from the U.S. Fish and Wildlife Service (FWS).

- Research activities may be limited to specified times or locations depending upon objectives of the research effort and the potential for conflict with other ongoing activities.

- All research activities (NPS-supported and non-NPS) should be reported annually using the Investigator's Annual Report computer program.

Exhibit 1 outlines steps the superintendent should take in obtaining a satisfactory research proposal and working with the researcher during the study. The exhibit may also be given to prospective researchers so that they may develop a better understanding of their roles and responsibilities and that of park staff regarding the conduct and administration of research in a park unit.

C. Project Initiation

NPS-funded research projects are initiated as per the project funding request requirements outlined in Chapter 5, Natural Resources Budget Formulation. Non-NPS funded projects conducted on NPS-managed sites must be initiated with a park-approved research proposal. These documents must be on file in the park or regional office, necessary permits must be issued, and coordination with the park superintendent or his/her designee must be completed before any work commences, regardless of the method of project administration.

It is the park's responsibility to issue any special use or collection permits needed for the research except in the case of paleontological or endangered species collecting, or sometimes in the case of use of controlled substances. In these cases clearance must be obtained from the regional chief scientist or regional chief of natural resource management, although approval and management of long-term work on endangered species may be delegated to park or CPSU scientists. All researchers (including NPS staff) may need to obtain additional state or federal agency permits as required by law.

The regional chief scientist or regional chief of natural resource management is ultimately responsible for completion of all needed research-related consultations with the FWS, under Section 7 of the Endangered Species Act, even though consultations may be initiated by park staff

where this responsibility has been so delegated. In such cases, copies of all consultation correspondence should be directed to the appropriate regional program manager by the park and the FWS.

Once all necessary documentation and permits are approved and distributed and, in the case of NPS-funded projects, funds are in hand or have been authorized by appropriate budget offices, research projects may be initiated by the park, CPSU, regional office, or Washington Office.

D. Project Implementation

Research in NPS units may be conducted via numerous mechanisms and procedures. All research should meet the standards and conditions for research in NPS units described above. Such projects will be coordinated by a park scientist or qualified resource management specialist. Close oversight is necessary to ensure timely knowledge of activities by park management staff and to prevent conflicts with park management and with other researchers and undesirable impacts on park resources and visitors.

All NPS-funded research, other than that conducted by NPS employees, must follow established procurement regulations for the U.S. Government as interpreted by Departmental and NPS guidelines. Many mechanisms of varying complexity exist, providing an avenue for almost every conceivable type of research undertaking. Research managers should take the lead in keeping park, regional, CPSU, or Washington Office research staff abreast of current processes and changes in those processes. The appropriate research manager should maintain a close liaison with the contracting officer in an effort to manage a research procurement process and philosophy which is consistent across the NPS. It is critical that all components of the NPS research procurement process be viewed as fair and credible by the research community and the general public.

The most commonly used mechanisms for research implementation in NPS units include:

NPS research staff. NPS research staff members may be given research assignments as appropriate by the park chief of research, the CPSU unit leader, the regional chief scientist, or the Washington Office research manager. This assignment will be included in an annual work plan developed by the researcher and approved by the appropriate science and program manager.

CPSU unit leaders, research staff, and cooperators. CPSU personnel may conduct research under the auspices of the cooperative agreement (see below) establishing the Cooperative Park Studies Unit. CPSU staff holding NPS appointments will be given research assignments by the unit leader, or the regional chief scientist, or Washington Office research manager, as appropriate, if there is no designated unit leader. Work plans will be developed as described above and will be approved by the regional chief scientist or Washington Office research manager, as appropriate. Unit leaders and staff who do not hold NPS appointments and cooperators may be assigned specific research projects by the regional chief scientist or Washington Office research manager, as appropriate, according to the provisions of the cooperative agreement establishing the CPSU. Cross-regional

involvement of regional CPSUs should be coordinated by the respective regional chief scientists and approved by the respective regional directors.

Purchase order or contract. Purchase orders are issued for research projects under $25,000 total cost. Contracts are issued for projects in excess of $25,000. Competition is required except in those rare situations where a "sole-source procurement" is justified. Purchase orders and contracts for a single year's effort may contain riders providing for extending the effort in each of a specified number of years without competition if product quality is acceptable and government funds are available. Open competition for research, like other professional service procurements, is a Servicewide policy and sole-source procurements will be executed only in the most clearly defensible situations.

Park and regional contracting officers should be consulted for further clarification, especially regarding the funding of unsolicited research proposals and the proprietary nature of unsolicited proposals until they are funded. Freedom of Information Act (FOIA) requests for such proprietary information **must** be denied to avoid government liability to the author(s) of the proposal.

Cooperative agreement. Cooperative agreements are the proper legal instruments to use whenever the principal purpose of the research relationship is the transfer of money, services, or anything of value to accomplish a public purpose of support or stimulation (rather than simple acquisition), and substantial involvement of both the NPS and the cooperator is anticipated in the conduct of the research. This implies that both the NPS and the cooperator will contribute substantially to the design and execution of the project and communication (e.g., publication) of its results. Cooperative agreements are usually negotiated between a park/regional office/Washington Office and universities, state and local governmental agencies, and non-profit organizations with special research or NPS interests. Cooperative Park Studies Units, discussed below, are established using cooperative agreements. Research managers should refer to NPS-20 and their park, regional, or Washington Office contracting officer when planning to develop this type of document.

Interagency agreement. Interagency agreements are completed between two or more federal government agencies or bureaus. They may be utilized when the NPS and another agency desire a mutual assistance relationship or when another federal agency has the skills and resources to complete a given project at a lesser cost or in a more efficient manner than other sources. Often, another federal cooperator may be the only source capable of completing a given project within a given time frame or within existing fiscal constraints. Research managers should refer to NPS-20 and their contracting officer for aid in preparing such an agreement.

Memorandum of understanding. Memoranda of Understanding (MOUs) document mutual agreements between NPS and a state or local government agency or other party where transfer of funds is not involved. Both parties should be active participants in the undertaking. The MOU defines the respective roles and responsibilities. See NPS-20.

Memorandum of Agreement. Memoranda of Agreement (MOAs) are used to provide for receipt of funds by the NPS from a nonfederal agency or organization for completion of a cooperative project. See NPS-20 and Chapter 5, Interagency Agreements.

Non-NPS funded research. Far more research is performed in parks by independent researchers with their own funding sources than is conducted with NPS funds. Research which addresses established park research needs should be strongly encouraged and solicited. Provision by the NPS of cooperative support and various types of in-kind contributions (e.g., housing, transportation, clerical support, supplies, and equipment) may help secure independently supported research. Publications identifying park research needs and potential NPS contributions to researchers are encouraged for attracting non-NPS scientists to work on NPS needs. Research which does not address documented management needs, but does offer unique scientific contributions to the society as a whole, does not significantly impact park resources or visitor use, and which cannot be conducted elsewhere may be conducted in NPS units.

All non-NPS funded research requires prior review by the park research manager and approval by the superintendent of a research proposal, and all necessary permits must be issued prior to start on-site. (See Exhibit 1 for details of the proposal process.) Special use permits for research must contain a requirement for the Investigator's Annual Report and, when appropriate, the semi-annual report, to be submitted to the park research manager each year according to the Servicewide schedule. These reports should comprise the non-NPS funded section of the Superintendent's Annual Research Report, thus providing complete documentation for all research being conducted in NPS units.

E. Project Management/Coordination

Individual research projects should be managed or coordinated by a designated research scientist, research administrator, or a qualified resource management specialist. A Contracting Officer's Technical Representative (COTR) is designated from among these staff for all NPS-funded research that is acquired through the normal procurement process (purchase order or contract). It is important that a qualified individual with appropriate technical expertise be designated for each procurement so that the technical merits of hypotheses, methods, data analysis, conclusions, and management recommendations may be evaluated directly and with peer review as appropriate prior to payment.

"Procured" research projects will generally require at least two meetings in the first year between the investigator, the COTR, and other appropriate park, regional office, or Washington Office staff. The first meeting should take place prior to the start of work for the purpose of analyzing the on-site activities and any necessary logistics or coordination with park staff. A second meeting should take place during the actual on-site research activities, preferably in the second half of the field season. The purpose of the second meeting is to verify the on-site activities and adherence to contracted methods, sampling levels, and schedule. At least one meeting should be held in each subsequent year of the project for the same purposes as the second meeting described above.

In addition, a project "close-out" meeting is required in the park, or other mutually agreed upon appropriate location, between the principal investigator (often a university professor or, in the case of commercial research, a project manager), field investigator (if different from the principal investigator - usually a graduate student or technician), the COTR, the park research administrator, the superintendent, and any other appropriate staff. The purpose of this meeting is to present the results, conclusions, and management recommendations to the assembled NPS staff. Also, decisions should be made at this time as to the subsequent publication of the research findings. COTRs should not be assigned more research projects than they can reasonably and effectively coordinate and manage.

F. Project Reporting

NPS staff researchers are required to report results to their supervisors using one or more of a variety of accepted ways. In all cases, however, progress should be reported annually prior to annual review of individual work plans. Annual reports should be submitted to the regional chief scientist as part of the Superintendent's Annual Report. All NPS researchers are also required to annually report on projects using the Investigator's Annual Report computer program. All of this information taken together provides the basis for the regional chief scientist's technical review of the entire regional research program.

Investigators for procured research projects may be required to report in a variety of ways. All NPS-funded purchase orders and contracts should require at least one report per year (although two are generally preferable). Cooperative projects should require reporting as specified in the enabling agreements. Final reports should be in the format of a scientific paper with a "stand alone" executive summary for quick reference by superintendents. Progress reports (all reports other than the final) must follow the format described in the contract, agreement, or purchase order. In addition, all investigators should be required to complete an Investigator's Annual Report Form during each year of the study. It is good practice to require a computer diskette submission as well as a "hard copy" version in order to facilitate incorporation of the report into regional and Servicewide data bases. It also may be appropriate to require that a popularized article be drafted by the investigator summarizing the project and its results for timely submission by the NPS or the investigator to news and other media.

As part of the permitting process, researchers conducting non-NPS funded research must be required to complete an Investigator's Annual Report each year and to provide copies to the park of all reports and publications generated using data collected under the respective research permits.

Wherever possible, the NPS should encourage and support publication of research results in the primary scientific literature and in the NPS Scientific and Technical Publication Series by NPS and contracted researchers. The peer review inherent in the publication process is critically important in maintaining the quality of research conducted in the National Park System. (See also Chapter 5, Publications)

G. Scientist and Project Evaluation

NPS staff researchers should be evaluated annually by their supervisors after seeking input from the regional chief scientist regarding the technical quality of their work. At least every 4 years staff researchers and research administrators must be reviewed according to the current Research Grade Evaluation Guideline and the Research Grants Grade Evaluation Guideline as stated in the NPS Personnel Management Letter No. 84-13 (511) (335), September 13, 1984. This procedure provides for true peer review of a scientist's accomplishments and is absolutely necessary to maintain quality, promote growth, and to appropriately reward researcher personnel. All scientists whose responsibility includes more than 50% of their time dedicated to research activities and all research managers/administrators who spend more than 50% of their time administering research are covered by the guide. The process not only evaluates accomplishments within a given grade level, it recommends the appropriate grade level for researchers and research administrators. The entire process is prescribed in the National Park Service Research Personnel Evaluation Plan.

Procured research should be evaluated at least twice annually by the COTR for the purpose of recommending to the contracting officer that requested partial and final payments be made to the investigator or his/her institution. Review of the regional research program should be conducted as part of the regular operations evaluation of the regional office. Ideally, more intensive regional research program evaluations should be conducted in conjunction with every other regional operations evaluation, i.e., every 4-6 years depending on the operations evaluation schedule. It is the responsibility of the regional chief scientist to produce necessary background information as well as an overview of the effectiveness of the regional program for the operations evaluation team. Review of the Washington Office research program will be conducted every 4-6 years.

Occasionally, teams of appropriate researchers and research managers may be requested by superintendents, a Regional Director, or the Director for special evaluations on an ad hoc basis. Such teams may be assembled to review park programs, CPSU programs, portions of a regional office program, or elements of Servicewide programs as deemed valuable.

II. The Role of Cooperative Park Studies Units

The Cooperative Park Studies Unit (CPSU) is one of the most important tools available to the Service for acquiring needed research. The authority to enter into cooperative agreements for the establishment of such units is established in 31 USC 63. This statute provides for the establishment of such units in cooperation with universities for the mutual pursuit of public purposes. Units are established by execution of a cooperative agreement for that purpose. (A model cooperative agreement for establishing a CPSU is included in NPS-20.) Projects conducted under the establishing cooperative agreements should have substantial involvement of both the NPS and the university. Substantial involvement of the NPS is usually in the coordination role of the unit leader, actual research conducted by NPS researchers at the unit, in-kind and real aid from park staff, and funds from a variety of sources. Substantial involvement by the university is usually

in the form of office and lab space provided, aid in project development and oversight by university staff, and in providing field assistants and principal investigators.

CPSUs take many forms, but there are two principal types. One involves a full-time NPS scientist serving as unit leader (or director). The second involves utilization of a university staff member as unit leader (or director) with support costs being reimbursed by the NPS. Either type may have a corps of cooperators in the university who may be called upon to provide a wide array of services. The primary focus of a particular CPSU may be one park, a group of parks, an entire region, or the entire National Park System. In all cases, it is advantageous to include language in the establishing cooperative agreement to provide for implementation of projects with a Servicewide, or even global, focus.

NPS funds may be transferred to the CPSU under the provisions of the cooperative agreement to support desired research without seeking competition. A "Justification for the Use of a Cooperative Agreement" (see NPS-20) should be completed for each modification (e.g., sub-agreement) to the original cooperative agreement to document the advisability of this method of obtaining research. Fund "transfers" are usually done as amendments, modifications, or work orders pursuant to the cooperative agreement and can only be effected by a warranted contracting officer. Scopes of work should be included with the amendments to clearly document the work to be done and the cooperative nature of the project.

Note: All procurement, including that done through the provisions of a cooperative agreement, is the primary responsibility of a contracting officer. The contracting officer should be involved in the development and implementation of research contracts, purchase orders, interagency agreements, cooperative agreements, and all subsequent documents such as amendments, modifications, and work orders.

ROLES AND RESPONSIBILITIES

This section discusses the primary responsibilities for research program design and management. Responsibilities for each step of research implementation are discussed under Program Guidance, above.

I. Park and Region

Because of differences in the size, complexity, and expertise of park and regional program staff, as well as in the authority and responsibilities vested in these staffs, it is necessary that the overall responsibility for the regional research program be the primary responsibility of the **regional chief scientist**. However, since different regional chief scientists possess differing levels of authority and resources, specific portions of the responsibility for research program design and management may be delegated to other scientists or CPSU unit leaders by the regional chief scientist or Regional Director. These scientists may be assigned to parks, groups of parks, the regional office, or to CPSUs.

In all cases, the primary responsibility for technical oversight of the regional research program is vested in the regional chief scientist. This oversight should include fiscal, or budgetary review, on at least an annual basis, of all regional programs to ensure consistent research funding and procurement policies, especially where equitability is required in dealing with multiple CPSUs.

Some large parks retain staff research positions. Some even have research "units" with a chief scientist or chief of research. In some regions, park researchers may be aligned under the regional chief scientist or a CPSU unit leader and detailed to the park for a definite tenure, or aligned under the park Superintendent or his/her designee. In such cases, primary responsibility for the design and management of the park's research program may be vested in one or more **park scientists**. However, technical oversight of that program, as described in this section, will be the responsibility of the regional chief scientist. This responsibility should involve, at a minimum, review of research assignments and accomplishments for scientific merit and at least annual reviews of park and CPSUs research budgets.

In addition, the regional chief scientist makes recommendations to park superintendents and the Regional Director regarding changes in assignment and duty station for regional research scientists in an effort to focus research resources on a region's most significant needs as well as to foster professional and career growth for researchers.

Some parks without researchers on staff have qualified professional resource managers capable of designing and managing a research program. Resource managers qualified to manage research should be classified in a professional series, hold an advanced degree in an appropriate scientific discipline, and be assigned to full-time or significant part-time resource management responsibilities. Parks without so-qualified resource managers should seek the aid of the regional chief scientist (or his/her designee in some regions) in developing research projects and programs.

The uniformity in vesting oversight responsibility in the regional chief scientists is critical in maintaining a credible Servicewide program. It is especially important in the NPS since the research program is so diversified among the ten regions. Since park superintendents are not required to have highly specialized research or research administration skills, park research programs without a common oversight authority may evolve disparate practices and policies.

Oversight by the regional chief scientist ensures that an experienced, qualified scientist maintains oversight of each park program in an effort to balance regional resources against the significance of park research needs. It further aids in communications and reporting, avoiding duplication of effort, maintaining continuity of program direction and development, facilitating professional growth of research personnel, and providing a single forum (i.e., the ten regional chief scientists) to represent the regional research programs. It is critical in documentation of program effectiveness through knowledge of research results and subsequent management application of those results.

Technical oversight by the regional chief scientist is not intended to diminish the administrative line authority of park superintendents over park-based researchers. Rather, it is meant to provide a

professional service to the superintendent and Regional Director in maintaining quality and continuity in an NPS program involving highly specialized technical staff.

Park superintendents play an important role in effective and successful research administration in the National Park Service. Most NPS-funded or assisted research is intended to be of direct benefit to park resources. Well-planned and administered research projects can allow superintendents to improve management of park resources, and visitors. A superintendent's principal research-related responsibilities include: (1) assistance in identifying of needed research projects, (2) research proposal review regarding impacts/benefits, (3) project approval, (4) review of the management significance and utility of research projects, both during progress and after they have been completed, and (5) implementation of needed management actions that may be determined through conduct of research.

II. Washington Office

Washington Office National Resources division chiefs manage research programs and/or conduct programmatic technical reviews of regional and park research in appropriate disciplinary or administrative areas. The **Deputy Associate Director, Natural Resources**, provides overall program direction, development, and evaluation.

INFORMATION REGARDING RESEARCH PROPOSALS AND COMMUNICATIONS WITH INVESTIGATORS - EXHIBIT 1

I. Research Proposal

A research proposal for outside research must be approved before the study begins. The superintendent uses it to evaluate the proposed research and determine whether it is an appropriate study to be performed within the park. The proposal describes the study methodology and products of the research, and it defines the form and chronology of research results. The proposal establishes which applicable permits and legal requirements that are necessary. It establishes the credibility of project authors and helps the manager assess the likelihood of study completion and quality of product. It states any role that NPS is expected to perform and identifies potential impacts (direct and indirect) to resources and operations.

Proposals should be reviewed by superintendents as quickly as possible while allowing adequate time for peer review by scientists, resources staff, and others. Superintendents without staff expertise should seek aid in reviewing research proposals from the regional chief scientist.

A. Elements of a Proposal

A research proposal format is presented below. Research grant proposals, graduate student proposals, cooperating association grant proposals, contracts, and similar documents may be substituted provided that the information identified below is included. The minimal proposal elements are:

Title page--title, name of principal investigators, institutional affiliations, addresses, phone numbers, estimated starting date and duration of study

Abstract--summary of the research (usually one or two paragraphs)

Problem statement--summary of the problem and the value of this study to the park and investigator's discipline

Objectives--clear statement of the research objectives, adding what information will be provided and how it can be used by the park

Background--brief literature review of what is known about the problem using pertinent published and unpublished references

Methods--detailed discussion of how the research will be accomplished, time frames for accomplishing each phase of the work, number of study plots, specimens to be collected, and overall protocol for the research. Impacts on natural and cultural resources, park visitors, and park staff should be clearly described.

Park participation--outline of assistance requested from the park (e.g., transportation, housing, data collection, analysis, funding, etc.)

Personnel--list of researchers and assistants expected to work on the study, their roles, vitae for principal investigators, and summarized background and training of assistants

Products--draft and final reports, maps, specimens, photographs, presentation to staff, etc.

Delivery schedule--time frames for product deliveries, interim reports, partial payments, work progress, etc.

Schedule of meetings--time frames for meetings with park staff

Budget--detailed budget, including personnel, equipment, transportation, and indirect costs to NPS and other funding sources

II. Communication with Researchers

Following the proposal review, the superintendent should write the researcher either denying or approving the research. An approval letter must have further information to orient the scientist. It should include the following, some of which can be presented as an attached introductory packet to investigators:

Park regulations. Pertinent general and specific park regulations should be discussed. Park specific regulations and restrictions can include use of aircraft, permanent markers, tagging wildlife, camping, visitor use areas, timing and location of study sites, travel in backcountry areas, etc.

Communications with staff. Consistent communications should be maintained between the staff and researcher. In the research approval letter, the superintendent should delineate certain communication links, such as the researcher's notifying a key staff member before coming to work in the park and the need for formal or informal meetings.

Permits. The letter stating approval for the research must enclose a special use or collection permit that specifies the conditions of research and any restriction on locations, methods, timing, etc. An NPS collection permit is required for the taking of any specimens. It describes the type, location, and amount of specimens taken. Other precautions or limitations can be stated on either permit, such as collecting specimens out of public view, preventing harassment of wildlife, and restricted boat or aircraft landing sites. Park regulations may also call for permits for use of backcountry, aircraft, river, boating, park animals, etc. Some state and federal permits may be required for special plants and animals or other situations.

Curation or disposal of specimens. Specific instructions need to be given to the researcher regarding cataloging, curation, and/or disposal of specimens. Specimens remain the property of the National Park Service and need to be properly documented.

Involvement of NPS staff. Any involvement of staff needs to be described so there is clear understanding of topics such as logistical support, housing, field assistance, etc.

Reports. Reporting requirements need to be clearly stated, including that the researcher will submit a final report to the superintendent as well as copies of any publications. Periodic reports should be required, with a submission to the annual investigator's report the minimum requirement. The superintendent should require review of the draft final report and take adequate time to circulate it for staff and/or peer review, as appropriate. A presentation to NPS staff may also be a condition of research.

III. Conclusion of Research

At the completion of the research, the superintendent should write the scientist acknowledging receipt of the report and how the results can be used in park management. In the event the research is not completed on schedule, the superintendent should contact the scientist and his/her afilliated institution describing the incomplete portion of the study. For NPS-funded research, a "closeout" meeting is required. (See Section E, Project Management/Coordination, in this Chapter.)

NATURAL RESOURCES INTERPRETATION

Professionals involved in natural resource management and interpretation share many common goals, most significantly the long-range protection of the natural resources in a park unit. Interpretation communicates the significance and value of the resource and natural processes to the diverse audience comprising "the public." In this way, it enlists the public's understanding, appreciation, and protection of the resource, making it a key resource management partner.

To insure the greatest possibility of successful program accomplishment, natural resource and interpretive specialists should coordinate their activities and form a close collaboration with each other, at park, regional and Washington Office levels.

Natural resource and interpretive specialists should work together in the preparation of resource management plans, statements for interpretation, and other documents, all of which should consider the impact of interpretive activities on all natural resources and the impact of natural resources on the direction and content of interpretive programming. Natural resource and interpretive specialists should work in close consultation to develop methods of implementing Servicewide initiatives involving resource management interpretation. They also should coordinate their activities to prevent resource damage, to incorporate natural resource management into interpretive activities, to incorporate interpretive components into natural resource management programs, and to enlist interpreters as knowledgeable observers detecting basic resource impacts.

Interpretive activities, including tours, interpretive media, demonstrations, and programs, must be factually accurate and consider the interrelationships of resources. Natural resource specialists need to help interpretive personnel minimize any adverse impacts on the resources and present the resource story accurately and sensitively. The purpose, philosophy, and standards for interpretation appear in NPS-6, the Interpretation and Visitor Services guideline.

INVENTORY AND MONITORING
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INVENTORY AND MONITORING

To fulfill the NPS mission of conserving parks, it is essential that park managers know the nature and condition of the resources in their stewardship, have the means to detect and document changes in those resources, and understand the forces driving the changes. This section discusses how the first three of these needs, (1) knowing the nature, (2) condition, and (3) changes in park resources, can be fulfilled through inventory and monitoring.

In addition to their diagnostic and dynamic baseline values, the long-term time-series data sets which monitoring generates are often required to establish cause and effect relationships, determine compliance with emission/discharge standards and regulations, or develop and evaluate mitigation of specific human-caused changes. Long-term studies to determine, regulate, or mitigate impacts need to be designed specifically for each application and are beyond the scope of the basic natural resources monitoring described in this section.

This discussion presents principles and basic program management guidance only. More specific guidance is given in NPS-75, Standards and Guidelines for Natural Resources Inventory and Monitoring (in draft).

DEFINITIONS

Natural resource inventory The process of acquiring, managing, and analyzing information on park resources, including but not limited to the presence, distribution, and condition of plants, animals, soils, water, air, natural features, biotic communities, and natural processes.

Natural resource monitoring The systematic collection and analysis of resource data at regular intervals, in perpetuity, to predict or detect natural and human-induced changes, and to provide the basis for appropriate management response.

POLICY AND PROGRAM OBJECTIVES

The NPS Management Policies states that:

> The National Park Service will assemble baseline inventory data describing the natural resources under its stewardship and will monitor those resources at regular intervals to detect or predict changes...that may require intervention, and to provide reference points for comparison with other, more [human-]altered environments. (4:4)

Program objectives are to:

1. determine present and future health of park ecosystems,

2. establish empirical limits of variation in park resources (i.e., define "normal" conditions or set limits of dynamic baseline),

3. diagnose abnormal conditions in time to develop effective mitigation, and

4. identify potential agents of human-induced change.

AUTHORITIES

In addition to the discussion of general authorities in Chapter 1, authorities affecting inventory and monitoring are the National Environmental Policy Act of 1969, which clearly requires certain knowledge of resource conditions to direct and evaluate effects of management actions; and the Forest and Rangeland Renewable Resources Planning Acts of 1974 and 1976, which also express Congressional insistence on inventory and monitoring of natural resources on all public lands in the United States.

RELATIONSHIP TO OTHER GUIDANCE

See NPS-75, Standards and Guidelines for Natural Resources Inventory and Monitoring (in draft), for more detailed guidance on inventory and monitoring programs. Inventory and monitoring of specific resources is also discussed in other sections of this Guideline. See especially Chapter 2, Vegetation Management, Native Animal Management, Freshwater Resources Management, Cave Management, Air Resources Management, Integrated Pest Management, Exotic Species Management, and Public Health and Safety; and Chapter 3, Grazing and Fishing.

PROGRAM GUIDANCE

No universally appropriate "off-the-shelf" procedures are available for direct implementation, nor is it likely that one set of procedures will be appropriate in type, in depth, or in technical approach to all parks for which an inventory and monitoring program should be in effect. Although the advice, counsel, and cooperation of other land and resource management agencies, universities, conservation organizations, and scholarly associations are highly desirable, each park should carry a large measure of responsibility for directing their inventory and monitoring efforts.

A specific inventory and monitoring program for each park needing such a program should be designed by qualified research personnel from appropriate disciplines, in cooperation with the superintendent. Initially, the superintendent should consult with a resident park scientist, regional chief scientist, CPSU research scientist, other NPS scientist, or university scientist to select the group of scientists who, in cooperation with resource management specialists, can prepare the inventory and monitoring plan. This plan should include not only the design of the park's substantive inventory and monitoring program, but also the administrative aspects of this program, including identification of costs, personnel requirements, and other resources needed. The inventory and monitoring plan may eventually become a component of the park's resource

management plan, but it should also constitute a complete, stand-alone plan that is specific to the individual park. A suggested design and implementation process is outlined below.

I. Program Design and Implementation

In designing the inventory and monitoring program, the scientists so engaged should draw up plans for aspects of the work to be conducted.

A. Determine what, where, when, and how to monitor.

1. Select ecological "vital signs" and components that accurately measure the resources or processes to be measured.

2. Select sites that represent the range of conditions under which monitored ecosystem components occur.

3. Select sampling frequencies appropriate for each parameter and management application.

4. Select sampling techniques--suited to observer variability--that are accurate, precise, and based on historical precedent whenever possible.

B. Establish data administration procedures.

1. Archive field observations (raw data).

2. Summarize observations and calculate descriptive statistics.

3. Utilize standard NPS data management and word processing software.

C. Establish reporting procedures.

1. Define the format of the report.

2. Describe the audience for which the report is intended, and to whom it will be distributed.

3. Establish the manuscript review procedures and standards.

D. Document the monitoring protocols.

1. Prepare handbooks.

2. Provide for a formal review process when it is necessary to change any monitoring protocols.

E. Implement the inventory and monitoring program.

1. Establish accountability for knowledge of resource conditions.

2. Obtain base funding at the park level for the monitoring.

II. Review and Evaluation

At each park where an inventory and monitoring program exists, there should be an institutionalized process for regular, periodic review and evaluation by qualified research scientists, in cooperation with resource management specialists, of the procedures being used and the results obtained. This review should be no less often than once annually, and it should be accomplished by the same panel or one similar to that which designed the initial inventory and monitoring program. The review should result in recommendations to the superintendent.

ROLES AND RESPONSIBILITIES

I. Park

The **superintendent** is responsible for assembling and consulting with the team of scientists who will develop the park inventory and monitoring program. **Park research scientists** help select the team and should be a part of it. **Park resource managers** participate in development of inventory and monitoring plans and, with the assistance of park rangers, implement the park inventory and monitoring program. **Park interpreters** communicate to the public scientific findings regarding park ecosystems and explain their significance.

II. Region

The **regional chief scientist** and **CPSU scientists**, at the request of the superintendent, help design park inventory and monitoring systems and develop new techniques for assessing ecosystem health.

III. Washington Office

The **Deputy Director, Natural Resources** develops Servicewide policy with regard to inventory and monitoring and coordinates the development of Servicewide inventory and monitoring guidelines and standards. **Natural Resources division chiefs** provide technical support in their areas of expertise.

DATA MANAGEMENT

Managers should receive regular, accurate information on the nature and condition of the resources under their care in order to effectively manage those resources. Information should be handled in a way that makes it easily accessible to managers and other users.

Guidance on the proper management of natural resource data and information will be contained in the forthcoming Natural Resource Data Management Handbook. This handbook will discuss the components of a sound data management program and provide guidance on how to plan, develop, and implement such a program, and on the roles and responsibilities of parks, regional offices, and the Washington Office.

This section of NPS-77 defines basic terms, briefly describes the key activities in management of natural resource data, and discusses the NPS sources of assistance.

DEFINITIONS

Data Empirical observations expressed in words or numbers in a "raw" (not directly usable) form.

Data management The acquiring, converting, and archiving of data.

Information Data that have been analyzed and put into a form useful for answering questions. Includes graphic images.

Information management The assembling, integrating, and synthesizing of information.

Natural resource management activities involve both data management and information management. Information management includes the tools of geographic information systems (GIS), data base management systems, text, spread sheet analysis, graphics, and computer aided drafting and design, among others. Typically, data are the domain of the subject-area specialists (e.g., botanists, wildlife ecologists, water resource specialists, air quality experts, maintenance engineers, lands specialists, historians, archeologists) who gather, assemble, and integrate data and information within their respective areas. Information managers, planners, and resource managers integrate and synthesize information among many different areas of specialty.

POLICY AND PROGRAM OBJECTIVES

The NPS Management Policies states:

> Sufficient information will be available prior to initiating a plan. Each park will develop, gather, compile, store, analyze, and update information about natural and cultural resources and regional demographic, ethnographic, and socioeconomic data relevant to planning and management. (2.5)

AUTHORITIES

See the discussion of general authorities in Chapter 1.

RELATIONSHIP TO OTHER GUIDANCE

See the Natural Resource Data Management Handbook (when completed); NPS-73, the Information Management guideline; NPS-62, the Acquisition guideline; and National Park Service ADP Standards. In this Guideline, see Chapter 5, Inventory and Monitoring.

PROGRAM GUIDANCE

The following activities are helpful in managing natural resources data.

I. Information Systems Planning

This activity involves the development of a plan that identifies data base needs, hardware options, software options, and staffing requirements. Plans should be developed for those NPS units that determine that automated management of resource data by researchers and resource managers is critical to the successful fulfillment of the park's mission.

The Washington Office Geographic Information Systems Division provides guidance and assistance in this planning activity as it relates to spatially oriented data. Individual parks are responsible for identifying their need for GIS in information management. Regional office GIS coordinators assist parks in developing plans, identifying needs, and coordinating with the GIS Division. Each region has developed a strategic plan for development and implementation of GIS.

Parks should also plan for their participation in several Servicewide natural resources non-GIS data base management applications. The Washington Wildlife and Vegetation Division is responsible for developing and implementing procedures, software programs, and data standards for Servicewide natural resources data base systems relating to non-spatial data. These include applications in the annual Servicewide research inventory, resource management plan data, and park pest management and pesticide application data. The GIS Division also is responsible for development and implementation of Servicewide procedures and standards for the NPFLORA and future NPFAUNA data bases. In general, these systems operate as distributed data bases, in which data are originally entered at the park level using the standard software and data standards. Data can then be aggregated up to compile regional and, eventually, Servicewide data bases. In addition, major Servicewide initiatives in the areas of inventory and monitoring and global climate change will involve development of standard spatial (GIS) and non-spatial data base management procedures, protocols, and standards, for use by parks participating in these efforts.

II. Acquiring, Converting, and Archiving Data

This activity involves acquiring, converting, and archiving park-based data for park, regional office, and program office use. Data gathering involves standard methods for measurement and quality assurance which are specific to a discipline. A well designed data collection form can help assure that all desired data are collected and recorded properly.

In finding and organizing existing data, a first step is to synthesize the characteristics (not the actual data) of existing reports, data sets, and other information. This step allows personnel to evaluate individual studies and decide whether they should be incorporated into a separate, more detailed data base.

Data base design is a critical step in this activity. A good data base design considers the types of analyses and reports that will be produced from collected data. This step includes standardization of data base documentation and data elements. The NPS has issued specific Servicewide guidelines concerning data element standardization in NPS-73, the Information Management guideline. Constructing GIS data bases is primarily accomplished at the Washington Office level by the GIS Division. The GIS Division transfers and installs GIS data bases at parks, regional offices, and program offices and archives these data at its office in Denver.

III. Acquiring and Maintaining Hardware

This activity involves acquiring and maintaining appropriate computer systems, including peripheral equipment to support the use of information management at parks, regional offices, and program offices.

The Administrative Services Division has issued guidance for required justification/documentation for the acquisition of computer hardware (NPS-62). In addition, the Administrative Services Division is the contracting officer for consolidated hardware contracts let by the Department and other bureaus.

The Information and Data Systems Division has issued guidance to ensure that computer equipment in different parts of the Service will be compatible and that computer programs developed in one part of the Service may be used throughout the Service. These guidelines are contained in National Park Service ADP Standards. The Geographic Information Systems Division tests and installs hardware to support park GIS operations. In addition, the Division develops standards for GIS-related hardware.

IV. Developing, Evaluating, and Using Software

This activity involves selection, enhancement, and use of software that supports park, regional office, and program office information management needs.

The Geographic Information Systems Division provides technical support for the use of GIS software. This technical support includes design, development, testing, and installation of software to support GIS operations. Parks, regional offices, and program offices generate products from the digital GIS data bases. These products typically include analyses, plots, and displays.

The Wildlife and Vegetation Division coordinates the design, development, testing, and implementation of the Servicewide natural resources data base management applications described under I, above, e.g., annual research inventory, resource management plan.

V. Staffing

This activity involves selecting and/or assigning responsibilities for leadership, coordination, systems management, data base management, programming, data entry, and operation.

Data base management means managing the data base for (1) the accuracy of content, (2) the accuracy of context, (3) accuracy of combined data sets, and (4) data format. Programming staff may be required for enhancing or customizing software. This activity may be staffed elsewhere as noted in IV, above. Data entry staff are required for the various activities identified in II, above. Operation or use of the data base requires trained users that are able to manipulate data to analyze complex resource management issues.

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INTERAGENCY AGREEMENTS

The purpose of this section is to provide an overview of interagency relationships into which the NPS can enter in support of the management of park natural resources. It is not the intent to provide details regarding the preparation of instruments which formalize these relationships. That information is included in NPS-20, the Federal Assistance and Interagency Agreements guideline. For the purposes of this section of NPS-77, the term "agreement" is used in the section title in a generic sense and is intended to mean any of the four types of legal instruments described below.

DEFINITIONS

It is imperative to recognize that definitive differences exist between Interagency Agreements, Cooperative Agreements, Memoranda of Agreement, and Memoranda of Understanding.

Cooperative Agreement A document describing a relationship between the federal government and a state or local government or other entity when the principal purpose is the transfer of money, property, services, or anything of value to the state or local government or other entity. The purpose is to accomplish a public purpose of support or stimulation authorized by federal statute in lieu of acquisition by purchase or lease. Substantial involvement of the NPS is anticipated.

Interagency Agreement A document describing an agreement between the NPS and another federal agency for supplies or services provided by the other agency. These agreements are also used to establish a cooperative or mutual assistance relationship between two federal parties, and to transfer funds from one agency to another.

Memorandum of Understanding A mutual understanding or agreement between the NPS and a state or local government or other party that is set forth in a written document in which both are participants. A Memorandum of Understanding does not obligate funds.

Memorandum of Agreement A mutual agreement relationship which differs from a Memorandum of Understanding in that it provides for receipt of funds by the NPS from a non-federal party.

See NPS-20, Chapter 3, for a further discussion of the different types of agreements.

POLICY AND PROGRAM OBJECTIVES

In an effort to enhance the planning for and protection of natural resources, the NPS encourages cooperative activities between NPS units and agencies of all levels of government. The NPS Management Policies states:

> The National Park Service is committed to working cooperatively with federal, state, and local agencies, native American authorities, user groups, adjacent landowners, and others in the management of natural resources and will seek to establish formal and informal lines

of communication and consultation in order to better achieve park management objectives. (4:1)

In many cases, this cooperation takes the form of daily or routine contact between agency personnel and the initiation of joint operational endeavors. In other cases, however, the relationship between the NPS and another agency may become more formal and require a written compact between the parties. Many such arrangements exist throughout the NPS at the individual park unit or regional office level. In still other cases, it is advantageous for the NPS to enter into a broad national agreement relationship which has application to many or all units of the System.

All agreement relationships, regardless of nature or scope, are subject to law and regulation. Applicable environmental compliance requirements (Environmental Compliance guideline, Endangered Species Act, etc.) must also be considered prior to consummation.

AUTHORITIES

NPS-20, Chapter 2, includes a list of laws which provide the framework for authority to enter into agreements with other entities. Frequently, individual agreement instruments outline the basis of authority as it relates to the specific subject of the agreement.

RELATIONSHIP TO OTHER GUIDANCE

NPS-20 should be consulted for procedural guidance on the development and use of interagency agreements.

PROGRAM GUIDANCE

There is no inclusive listing of all interagency agreements which the NPS currently has in effect relating to natural resource management. Exhibit 1 is an example of an interagency agreement between the NPS and the Fish and Wildlife Service.

Examples (topics and parties involved) of some other agreements of interest in this area are listed on the following page.

Spotted Owl Management	NPS, FWS, USFS, BLM
Program Coordination and Technical Assistance	NPS, Bureau of Reclamation
Planning and Program Coordination	NPS, BLM
Planning and Program Coordination	NPS, USFS
Forest Insect and Disease	NPS, USFS
Wildland Fire Management	NPS, BLM, BIA, FWS, USFS
Reclamation of Abandoned Mines	NPS, OSM
Geothermal Leasing	NPS, BLM
Marine Debris Survey	NPS, National Marine Fisheries Service

Regional and Washington Office contracting officers should be consulted prior to initiating discussion on a potential agreement, to determine if an agreement is already in effect which may be pertinent to the issue at hand. Program area offices (e.g., water resources, fire management, air quality) should also be consulted for guidance prior to considering or initiating an interagency agreement.

ROLES AND RESPONSIBILITIES

The roles and responsibilities of NPS employees are outlined in the terms of the specific agreement in question. In general, field units are directly involved in implementation of agreements and may be involved in preparation of those agreements when they affect only the area under the field unit's supervisory control. When agreements involve multiple parks or the entire System, either regional offices or the Washington Office takes the lead in developing the agreements. Field unit personnel may be consulted in these cases. In interagency and cooperative agreements, that by definition involved funding commitments, the park, regional office, or Washington Office Contracting Officer is responsible for the execution of the agreement.

Technical input and implementation of Servicewide agreements relating to natural resource management are the responsibility of the program office(s) involved.

INTERAGENCY AGREEMENT BETWEEN NATIONAL PARK SERVICE AND FISH AND WILDLIFE SERVICE - EXHIBIT 1

Article I. Background and Objectives

THIS INTERAGENCY AGREEMENT is made and entered into by and between the Research Division, Fish and Wildlife Service, U.S. Department of the Interior, hereinafter referred to as the Fish and Wildlife Service (FWS), and the National Park Service, U.S. Department of the Interior, hereinafter referred to as the National Park Service (NPS), under the provisions of the Act of June 30, 1932 (31 USC 1535), (the "Economy Act").

The NPS administers lands at Apostle Islands, Pictured Rocks, Sleeping Bear Dunes, and Indiana Dunes National Lakeshores and desires a study to accurately determine the distribution and status of piping plovers in National Park Units in the Great Lakes area, and develop management actions to protect existing plover nesting populations and habitats.

The FWS desires to participate with the National Park Service in making this study and has the expertise and personnel to conduct the necessary studies through the Missouri Cooperative Fish and Wildlife Research Unit (MCFWRU).

Article II. Statement of Work

A. The **Fish and Wildlife Service** Shall:

1. Map, quantify, and evaluate the quality of piping plover nesting habitat with National Park Units in the Great Lakes.

2. Evaluate the potential of unoccupied habitat for re-establishment of piping plover breeding populations in National Park Units in the Great Lakes.

3. Determine the availability of food items at potential piping plover nesting habitats in the Great Lakes National Park Units and compare with known plover nesting sites.

B. The **National Park Service** Shall:

1. Provide $14,119 from FY 1987 funds to the FWS, MCFWRU, to provide for literature review, preparation for field work and the first field season. Contingent upon funding beyond FY 1987, the NPS will provide $16,777 in FY 1988 for a second field season, and $12,559 in FY 1989 for a third field season, data analysis, and final report write-up. Total funds for each year identified include a 8.5 percent FWS overhead charge.

2. Provide orientation to the parks for the project's principal investigator and arrange for both an initial NPS/FWS meeting within 4 months of the beginning of the project and a closeout session following acceptance of the final report.

Article III. Term of Agreement

Unless terminated by written notice, this Agreement will remain in force until December 31, 1989.

Article IV. Key Officials

Responsibility for conduct of the activities contemplated by this Agreement shall be exercised by the following key officials:

Mr. Gary Willson, Ecologist, Midwest Regional Office, NPS

Dr. Charles F. Rabeni, Leader, Missouri Cooperative Fish and Wildlife Research Unit, Fish and Wildlife Service

Article V. Payment

A. Nothing in this Agreement shall be construed as obligating either party to expend or as involving the United States in any contract or other obligation for the future payment of money in excess of appropriations authorized by law and administratively allocated for this work.

Requests for payment shall be submitted on a Standard Form 1081 to the Division of Finance, NPS. All SF-1080 billings shall reference IA-6000-7-8005 and indicate the period of performance for the costs claimed.

Article VI. Property Management and Deposition: not applicable

Article VII. Prior Approval: not applicable

Article VIII. Reports

Under this Agreement a draft final report shall be submitted no later than October 1, 1989. THe NPS shall have 60 days to review and provide the MCFWRU written comments on the draft final report. In consideration of these comments, the MCFWRU will revise the draft as needed and provide 10 copies of the final report to the NPS by December 31, 1989. The NPS shall be identified on the title page of the final report as follow:

Prepared for:
National Park Service
Midwest Regional Office
1709 Jackson Street
Omaha, Nebraska 68102
IA-6000-7-8005

The final report will include an executive summary and all raw data as an appendix. In addition to the final report, the Fish and Wildlife Service shall submit written annual progress reports (five copies) following the signing of this Agreement. The copies of each report shall be mailed to Midwest Regional Office, 1709 Jackson Street, Omaha, Nebraska 68102, Attention: Hubert Carter.

Article IX. Modification/Termination

This Agreement may be modified by mutual consent of both parties. Either party may terminate this Agreement by providing sixty (60) days written notice to the other in advance of the proposed termination date.

Signatures

Date	Contracting Officer, Fish and Wildlife Service
Date	Chief, Contracting and Property Management, Midwest Region, National Park Service

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NATURAL RESOURCES BUDGET FORMULATION

To achieve their goals for perpetuation of park natural resources, natural resource managers require adequate personnel and dollar resources to permit conducting desired activities within acceptable time frames. This section discusses the steps involved in effectively preparing budget proposals and in documenting their importance for meeting approved natural resource goals. This section also discusses the influence of the federal budget cycle on the process by which managers seek to increase their base funds and FTEs.

DEFINITIONS

Budget allocation The process of disbursing appropriated funds to designated activities.

Budget formulation The process of developing proposals and accompanying justifications for future years' budgets.

AUTHORITIES

See the discussion of general authorities in Chapter 1. Annual appropriations acts provide the authority for spending federal funds.

RELATIONSHIP TO OTHER GUIDANCE

Detailed guidance on the NPS budget process is provided in NPS-71, the Budget and Programming guideline (in draft). In this Guideline, see Chapter 4, Resource Management Plan. In addition, specific guidance on program thrusts, required formats, and due dates for budget formulation activities are found in the Service's annual budget formulation calls. Similarly, guidance for allocation of Servicewide natural resource project funding sources is found in each funding source's periodic calls for setting priorities.

PROGRAM GUIDANCE

The Service's natural resource funding needs are met through a variety of sources. Currently there are nine sources dedicated to natural resource activities, some of which are dedicated natural resource bases, others of which are contained within other types of bases. The natural resource bases are: park natural resource base (which may include both natural resource management and natural science components), regional natural resource base (which includes natural resource management and natural science components), Servicewide natural resource base (which includes separate programs for air quality, geographic information systems (GIS), inventory and monitoring, global change, natural resource preservation (NRPP)), and Servicewide water resources base. The other, more general sources which may be available to support natural resource activities include such accounts as park maintenance, regional or Servicewide planning, Firefighting, Mining and

Minerals Management, and perhaps others. The guidance provided in this section focuses specifically on the funding sources that have components dedicated to natural resources.

I. Purposes of Dedicated Funding Sources

Each of the dedicated natural resource funding sources meets a specific purpose.

A. Park Natural Resource Base

Park base funds provide salaries and support for permanent and seasonal park personnel and for the long-term, recurring projects that they conduct. Park base funds also are used to support shorter duration activities. The superintendent allocates park base funds annually according to the overall needs of the park and relies on the annually updated, multi-year file of planned natural resource allocations and projected budgetary needs in the park's resource management plan to determine the annual natural resource allocation from the park base. This annual allocation is distributed among the various park divisions according to the assignment of responsibilities shown in the resource management plan. The superintendent also uses the annually updated, multi-year file to develop base increase requests for the budget formulation process.

B. Regionwide Natural Resource Base

Regionwide base funds provide salaries and support for permanent and temporary regional office natural resource management and science personnel, support a regionwide scheduled natural resource inventory and monitoring program for identified parks in the region, maintain a regionwide cyclic natural resource management program for identified parks where park needs are intermittent rather than continuous, and support individual but significant park projects in cases where park budgets clearly are unable to provide the funding. The Regional Director allocates regionwide base funds, and parks receiving allocations from this funding source may not reprogram them without specific approval by the Regional Director.

Each region maintains a multi-year file of projected park and regional natural resource budgetary needs which is derived from resource management plan data and is updated annually. This file is used to allocate regional base funds, to encourage parks to cooperatively support projects where appropriate, and to develop integrated park and regional natural resource base increase requests for the budget formulation process.

C. Servicewide Natural Resource and Related Bases (includes natural resource, federal wildland firefighting, and water resource studies)

Servicewide base funds provide salaries and support for permanent and temporary Washington Office natural resource personnel. These funds also support identified, nonrecurring, park, multi-park, and Servicewide natural resource management and natural science projects, including research on management and policy issues of multi-region, national, and international significance, through

the air quality, water resources, GIS, NRPP, and firefighting budget allocation processes. Each of these targeted funding sources has its own eligibility, priority-setting, and funding rules, and each maintains its own periodically updated, multi-year file of planned future funding allocations for approved park, regional, and Servicewide natural resource projects. The Director is responsible for allocations from these Servicewide base funds, and regions and parks receiving such allocations may not reprogram them without prior Washington Office approval. Guidance for allocation to natural resource projects of Servicewide funding sources is found in each funding source's periodic calls for setting priorities. Some or all of these funding sources may require completion of a Form 10-238.

II. Requests for Increases to Base Funding

Requests for increases to base are submitted on Form 10-237 as may be updated, or on whatever computer-based equivalent may become available. Such requests for increases to base are designed to fit whichever base is being increased.

A. Park Natural Resource Base

Requests for increases to park bases must relate to one or both of the following activities:

1. indefinitely recurring operational natural resource tasks to be carried out by in-park staff,

2. provision of salaries and support costs for additional scientists, monitoring specialists, or natural resource management specialists who are to be duty-stationed in the park.

Requests for support of nonrecurring projects, capital improvement projects, or maintenance that does not directly improve the status of park natural resources are not allowable as park natural resource base increases.

B. Regionwide Natural Resource Base

Requests for increases to regionwide bases must relate to one or more of the following activities:

1. inventorying or monitoring of park natural resources in a cyclic manner among a designated group of parks,

2. reducing a backlog of significant park research or resource management projects that cannot be conducted in a timely fashion due to existing inadequacies of park or region natural resource bases,

3. developing or enhancing a multi-year regional program to meet cyclically recurring park research or resource management needs where the individual needs cannot be

met from existing park base funding, can be grouped by similarities of activity, and, by being grouped into a program, can be met in a more timely fashion than otherwise would be possible,

4. providing salaries and support costs for additional scientists reporting to the regional chief scientist, and

5. providing salaries and support costs for additional natural resource specialists reporting to the regional chief of natural resources management.

C. Servicewide Natural Resource Base

Requests for increases to the Servicewide base must be intended to achieve one or more of the following:

1. Increase the level of effort of air quality or acid precipitation related activities including monitoring, visibility studies, PSD permit reviews, or impacts on natural resources.

2. Increase the level of effort on less than 5-year, non-recurring water-related activities in flood plain and flood hazard delineation, locating and initial testing of potable water sources, inventory and quantification of water resources and water rights, water resources management technical planning support, water quality technical support, and identification and mitigation of water-related internal and external influences on park resources.

3. Increase the ability of the GIS program to support park and Servicewide needs for developing GIS systems and techniques.

4. Increase the level of supplemental NRPP funding for nonrecurring park and regional natural resource projects which involve significant resources, levels of funding significantly greater than can be met through existing park or region bases, and require no more than 3 years of funding.

5. Increase the level of funding for Servicewide inventory and monitoring activities.

6. Increase levels of staffing or project support for Washington Office natural resource program staffing.

In determining to seek an increase to base through the budget formulation process, a program manager must be able to demonstrate that the current base he/she directly manages is fully utilized in supporting higher priority needs, that other bases to which proposals for funding may be submitted are also so utilized for higher priority needs, that there is little to no chance of receiv-

ing funding within the necessary time period, and that failure to obtain an increase to base will result in a significant loss of, or impact to, important park natural resources.

In developing a proposal for an increase to base, the natural resource program manager should be aware of the timing of the proposal in relationship to the entire federal budget formulation cycle. The President's formal budgetary proposal to the Congress must be submitted to the Congress in January, almost 9 months before the October 1st start of the fiscal year for which it is being proposed. To meet this deadline, the Executive Office of the President (OMB) must have final recommendations from each cabinet agency (e.g., Department of the Interior) by the previous September, the Department of the Interior must have final recommendations from its bureaus (e.g., NPS) by the previous June, the Director of the NPS must have final recommendations from the Regional Directors and Washington Office program managers by the previous April, and the regional directors must have final recommendations from park and office managers by the previous March.

To obtain an addition to base at the October 1st start of any given fiscal year, natural resource managers must have completed the identification of their needs and the development of their supporting justification material no later than March of the previous year, and therefore should have started these activities as early as January of that year, which is 21 months before any increase in funds first could be obtained. The length of this process makes it clear that natural resource managers should develop multi-year budget allocation plans to provide them with a tool for identifying future budget increase needs early enough to ensure them the ability to secure such increases in a timely fashion. The multi-year programming sheets in individual park resource management plans and the regional multi-year file not only show how existing funds are to be allocated, they also provide the necessary multi-year framework for projecting future needs for increases to base funds.

Information on natural resource needs identified in resource management plans is used directly by individual parks to develop park funding request priorities. It is used by regional offices directly for developing regional priorities for park project funding requests and indirectly for developing regional office program priorities for requests to increase regional research and resource management capabilities. Similarly, the Washington Office indirectly uses the information, through aggregation and analysis, to develop Servicewide programs both as Service initiatives and in response to national and international initiatives developed by others.

ROLES AND RESPONSIBILITIES

I. Park

Park activities to formulate natural resource budget requests require five steps:

1. Develop statements of need that are grounded in factual descriptions of those park natural resource deficiencies that are caused by lack of adequate personnel or dollar resources.

2. Develop workable proposals for resolving each of the deficiencies.

3. Prepare documented estimates of what level of increase of base funds and personnel, or of what regional or Servicewide one-time funds are required to achieve each of the proposed actions.

4. Integrate the identified natural resource increase needs into the park's total list of needs for increases to base and develop a parkwide priority list for all of these needs.

5. Submit a parkwide list of needs for increases to the regional office in accordance with the regional office's instructions.

In carrying out these steps, it is important to remember that the probability of the region supporting a park natural resource base increase request is greater when the park natural resource need appears closer to the top of the park's parkwide priority list.

II. Region

The regional office's efforts to formulate natural resource budget requests require five steps:

1. Review the park proposals to assure that they are well justified and that cost estimates are accurately prepared.

2. Draw from its aggregated regional multi-year file those recurring park projects which should be initiated soon and which exceed existing park or region base funding or personnel capability and add these stand-alone park needs to the regional list of needs.

3. Use the remaining park needs and associated justifications as the basis for developing consolidated, multi-park oriented proposals for increases to the region's natural science and natural resource management bases.

4. Integrate the consolidated proposals into the regional list of needs and set priorities.

5. Represent the identified park and consolidated regional needs in discussions with the Director and, as may be appropriate, the Department, OMB, and the Congress.

III. Washington Office

The Washington Office's natural resource budget formulation activities involve four steps:

1. Review the regional natural resource submissions for compliance with NPS natural resource policy and assure that justifications and estimates respond to the factors identified in the NPS annual budget formulation call.

2. Draw from both regional natural resource submissions and aggregated regional multi-year files those high priority projects that, in combination, can be used to support development of Servicewide natural resource budgetary initiatives which respond to stated NPS, Departmental, or Presidential budget formulation priorities.

3. Assign Servicewide priorities to the park, region, and Washington Office natural resource proposals as part of the total priority setting process.

4. Represent all of the identified Service natural resource budgetary needs in discussions with the Department, OMB, and the Congress.

PUBLICATIONS

The NPS seeks to disseminate natural resources scientific, technical, and management information for both the advancement of science and to support the NPS objectives. The NPS policy requires that "the results of all scientific activities conducted in the parks will be made available to park managers, the scientific community, and the public through both technical publications and popular media." (Management Policies 4:3) Management strategies require that natural resources scientists, technical specialists, and resource managers initially disseminate data and results of research and resource management information quickly within the NPS through the NPS natural resources series or other established the NPS publications.

The following six natural resources series may be used to disseminate natural resources information through publication at the national (Servicewide) level. All manuscripts for these natural resources series must go through a formal planning process, meet all the guidelines for national series, and be approved by the Associate Director, Natural Resources.

1. Scientific Monograph Series - refereed

2. Transactions and Proceedings Series - refereed

   These two natural resources refereed scientific series provide alternatives to outside journal publication.

3. Technical Report Series - peer reviewed

   This natural resources technical peer-reviewed series usually contains information of a preliminary nature and are primarily for internal use. This series should be used prior to or during development and review of journal-quality articles. This information may then be revised and submitted to professional journals.

4. Annual Science Report Series

   This yearly natural resources science report lists the research activities in each park.

5. Natural Resources Report Series - peer reviewed

   This natural resources management series addresses policy considerations, management applicability, and sensitive issues.

6. Park Science Bulletins - peer reviewed

   These quarterly bulletins disseminate management implications of research.

Only three natural resources regional series may be used to disseminate natural resources information through publication at the regional levels. Approval authority for regional series is at a Regional Director's discretion. No other natural resources series may be used or developed. Parks should disseminate information through a series at a regional office or at a Cooperative Park Studies Unit.

1. Technical Report Series - peer reviewed

2. Annual Science Report Series

3. Natural Resources Report Series - peer reviewed

Other NPS publications, such as the Courier and Interpretation magazine, may be used to disseminate natural resources information through publication.

All NPS personnel are encouraged to submit natural resources material to outside publications. General information articles sent to popular publications should be approved through established channels and in accordance with the NPS policies.

After initial dissemination within the NPS through natural resources national or regional series, or other NPS publications, the data and results of research should be published in widely distributed and indexed outside journal publications that have review procedures that ensure high quality, a wide distribution, and recognition in the scientific community. Outside journals provide the means to disseminate data and results of research to the international and national scientific community. Such publication allows verification of the soundness of research results and develops credibility in the scientific community, which is especially important when research results are used to support managerial activities where controversy exists.

Specific policies, standards, and procedures for disseminating natural resources information through publication are in the NPS Natural Resources Publication Management Handbook (1991). Copies are available at each Regional Office through the Regional Chief Scientist, or at the Natural Resources Publication Office, P.O. Box 25287, Denver, CO 80225-0287.

COLLECTIONS
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COLLECTIONS

Natural resource specimens preserved and maintained in park museum collections play an important role in the NPS mission to preserve and protect the natural resources within each park. Natural resource collections document park resources for the purposes of information, resource protection and management, and future analysis. Systematically collected specimens are the products and subjects of vital research that provide baseline data necessary for continued and effective park management. Museum specimens collected in the past may provide information that is otherwise unobtainable. The purpose of this section is to give guidance on the management of natural resource museum collections.

DEFINITIONS

Museum collection An assemblage of objects, works of art, historic documents, and natural history specimens collected according to a rational scheme, and maintained so they can be preserved, studied, or interpreted for public benefit.

Natural resource museum collection A collection comprised of permanently retained specimens and samples taken from the living and nonliving components of the natural world and field data, records, and reports generated by the collecting and research activities. A specimen without its associated documentation has limited or no scientific value. The decision to permanently retain a specimen in a park's museum collection depends on the purpose of the collecting activity or the recommendations of the researcher/collector. General reference collections, voucher specimens, exhibit specimens, and most research specimens are managed as part of a park's museum collection. Specimens included in a scientist's non-permanent working research collection, consumed or destroyed during the process of collecting or laboratory analysis or used in interpretive talks, normally are not made part of a park's museum collection.

Natural resource collections include:

Biological specimens Whole or parts of biological organisms (i.e., flora and fauna), or several representatives of the same type of organism. Each specimen contains the genetic and morphological characteristics that make living individuals unique.

Geological specimens Samples that document the physical environment of the park, including soil, mineral, and rock samples. Geologic samples can provide essential information about both long- and short-term phenomena.

Paleontological specimens Specimens that represent fossil plants and animals, or their traces, preserved in a geological matrix. Where fossils occur on NPS property, these resources are protected in situ unless collected for the purposes of research or interpretation.

Environmental samples Samples collected to study and document the influence of human activities upon the biosphere, particularly the presence and effect of toxic compounds. The task of analyzing this class of samples is often specific to the impact being studied, which requires each sample to be collected with specialized techniques. Environmental samples include: biological tissues and/or organs; soil, water, and air samples; water or air filters; and strip charts that record environmental data.

Project Documentation Data, records, reports, and other related information generated as a result of research activities conducted within a park or on museum specimens collected in a park. Natural resource archives may contain field notes, daily journals, maps, drawings, photos and negatives, slides, videotapes, raw data sheets, remote sensing data, copies of contracts, correspondence, repository agreements, specialists' reports and analyses, reports and manuscripts, collection inventories, field catalogs, analytical study data, sound recordings, computer documentation and data, tabulations and lists, specimen preparation records, conservation treatment records, and reports on all scientific samples lost through destructive analysis.

POLICY AND PROGRAM OBJECTIVES

The NPS Management Policies states:

> Natural resource collections include nonliving and living specimens and associated field records. If placed in exhibits or retained in permanent collections, nonliving specimens and their associated field records will be cataloged into a park's museum collection. (4:4)

Natural resource collections are managed according to NPS Management Policies, Museum Objects and Library Materials (5:9-11); Security and Protective Measures (5:13-14); and Preservation of Data and Collections and Protection of Research Potential (5:3-4).

A museum collection is generated and maintained to document and support a park's resource management, research, and interpretive programs. The NPS museum program objectives include the commitment to collect, document, and preserve objects, specimens, samples, and associated records as defined within a park's approved scope of collection statement. The collection is a nonrenewable resource. Access must be provided to researchers and the public in order to effectively use and benefit from the existence of a park museum collection.

A critical element in the preservation of permanently retained natural resource collections is ensuring that early and continuing consideration of curatorial concerns is an integral part of the park's scientific research planning process. Many park research projects produce specimens that may have inherent long-term preservation value. The responsibility for the curation of such specimens and associated data must be determined by a park's scientific and curatorial staff prior to starting a research project and be written into the conditions of each research proposal, cooperative agreement, contract, or collecting permit. Planning includes determining provisions for

field documentation and preparation of specimens, identifying the recipient NPS or non-NPS repository for the specimens, and ensuring that each project funds the cataloging and initial preservation and storage costs.

AUTHORITIES

The authorities that support the NPS museum program include the Antiquities Act of 1906, the NPS Organic Act, the Historic Sites Act of 1935, the Management of Museum Properties Act of 1955, and the Archeological Resources Protection Act of 1979. Additional authority for maintaining a museum collection may be defined in a park's enabling legislation.

Other authorities that relate specifically to natural resource collections include the Lacey Act of 1948, the Marine Mammal Protection Act of 1972, the Endangered Species Act of 1973, as amended, the Bald Eagle Protection Act of 1940, the Migratory Bird Treaty Act of 1918, 36 CFR 2.5 (Revised), the 1983 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and appropriate state laws.

RELATIONSHIP TO OTHER GUIDANCE

NPS standards for managing natural and cultural museum objects are outlined in NPS-28, the Cultural Resources Management guideline. See also NPS Special Directive 80-1, Guidance for Meeting NPS Preservation and Protection Standards for Museum Collections; the NPS Museum Handbook; the NPS Automated National Catalog System (ANCS) User Manual; and the NPS Conserve O Gram series. See NPS-53, the Special Park Uses guideline for guidance on specimens collected by permit.

In this Guideline, see Chapter 2, Paleontological Resources Management, and Chapter 5, Research Administration.

PROGRAM GUIDANCE

The NPS program for managing museum collections addresses acquisition, documentation, preservation, and use of objects and specimens. The specific guidance documents listed in Relationship to Other Guidance, above, provide technical information. This section summarizes some of this information.

I. Acquisition - Scope of Collections

The purpose and content of a park's natural resource museum collection is defined in an approved scope of collection statement. Refer to the NPS Museum Handbook, Part I, Chapter 2 for guidance on writing a scope of collection statement.

The Code of Federal Regulations, 36 CFR 2.5, Research Specimens, states the conditions under which a park superintendent may issue collecting permits. Since April 30, 1984, paragraph (g) of this regulation requires that specimen collection permits contain specific curatorial conditions. These conditions are not retroactive. Refer to NPS-53, the Special Park Uses guideline, and the NPS Museum Handbook, Part II, for further guidance on the requirements of this regulation.

The value of a natural resource museum collection is in its use or potential use. Some categories of functional unity and utility are as follows.

A. Reference Collections

1. General Reference Collections

This category consists of museum specimens used for the scientific study of a particular group or subject matter. Species identification and comparison, age and sex characteristics, morphological details, and mineral crystal recognition are all examples of the uses of a reference collection. The reason why the specimen was collected is not critical, only that it be a well preserved and documented specimen or sample of its type. When such collections are assembled to represent the entire diversity of a particular taxon or group, such as vascular plants, birds, or soils from a park, then the collection is a synoptic collection for that group. A synoptic collection can eventually serve the purpose of documenting the complete assemblage of plants, animals, minerals, rocks, and soils found in the park.

2. Voucher Collections

There are several categories of voucher collections. All voucher specimens document scientific research and resource management activities. Voucher specimens facilitate the re-evaluation or re-analysis of past scientific and/or resource management efforts, and serve as a means for establishing and documenting for future reference the species identity of the subject of research activities. For scientific studies involving poorly understood or described species, or groups that are the subject of frequent taxonomic revisions, voucher specimens are increasingly important.

Type specimens are a subcategory of voucher specimens. A type specimen is the specimen used to describe a new species for the first time. The definitions and procedures for type specimens are tightly controlled by international codes. Type specimens have extremely high scientific value. They are managed as NPS controlled museum property and must be afforded appropriate storage and security.

B. Research Collections

The value of a museum permanent research collection is in its ability to provide answers, or the material from which answers can be obtained, to research questions. Questions about issues of morphology, anatomy, population distributions and abundances, demographics, systematics,

taxonomy, ecology, genetics, evolution, and physiology are commonly addressed by examining museum specimens and their associated data.

C. Exhibit Collections

The interpretive and educational function of museum collections is often embodied by their display in public exhibits. Specimens used in exhibits effectively communicate species identification, explain scientific concepts, and illustrate park resource management issues. Although the story of specimens in a park exhibit is usually told in a broader context than the particular specimen, each individual exhibit specimen should be fully documented with complete and accurate collection data. The uniqueness of each particular specimen, as indicated in the museum collection records, can enrich the interpretive statement of the specimen. Complete collection data also allow the specimen to be used in other contexts, such as in a reference collection. While the value of an exhibit specimen is due, in large part, to the skill and artistry of the preparator, the ultimate value of exhibited specimens is that it supports the goals and objectives of the park's interpretive program.

II. Documentation of Collections

Procedural guidelines for documentation of NPS museum collections is contained in the NPS Museum Handbook, Part II, Museum Records, Chapters 2 and 3. This section provides a summary of this information to guide managers.

In order for parks to be able to manage their natural resources knowledgeably, basic information on these resources must be gathered and recorded in such a manner that it can be efficiently retrieved. Meticulous documentation of natural resource museum specimens is essential. Each specimen or group of specimens must be documented from the time it is collected in the field until it is placed in storage or on exhibit. Documentation is a continuous process that starts when a specimen is first collected and includes field notes, field cataloging, mapping, photographing, conservation treatment and subsequent annotations, and other information gathered about a specific specimen.

A. Specimen Labels

NPS specimen labels:

- become a permanent record and identify the specimen as belonging to the NPS irrespective of where it is being stored or used;
- provide data that are essential to the identification of the specimen and are required for the proper cataloging of the specimen; and
- must be completed by the collector before cataloging.

Specimen labels are provided by the NPS to park and non-NPS researchers who collect specimens as part of an approved research project.

For guidance on standard labeling procedures refer to the NPS Museum Handbook, Part II, Appendix H.

B. Accessioning

Accessioning establishes legal custody and ownership, and records basic information about a specimen or group of specimens. Each accession results in a file that contains all pertinent written or image-based documentation about the acquisition of the collected specimens (e.g., collecting permit, receipt for property form, related correspondence).

The Accession file is a permanent park record. It is not subject to disposition under FPMR 101-11.4, General Record Schedules (GRS). These records and the Accession Book must be kept in a secure fire-resistant file cabinet.

Refer to the NPS Museum Handbook, Part II, Chapter 2, for guidance on accessioning procedures.

C. Cataloging

The cataloging process records the documentary information of the specimen and can serve as an index to additional sources of information. It is the primary property and location record of a natural resource specimen. This information is entered into the NPS Automated National Catalog System (ANCS), making the information available for future accountability, inventory, and research purposes.

The use of longitude/latitude or Universal Transverse Mercator Grid (UTM) coordinates is required in the natural resource specimen catalog record to integrate information into the Geographic Information System (GIS). These data bases allow for efficient and effective use of the collection information for park-related management programs, for determining gaps in research needs, and for helping resource managers make decisions and set priorities, for the following programs:

- Inventory and monitoring
- Environmental compliance
- Fire planning
- Development planning
- Wildlife management
- Vegetation management
- Environmental impact plans
- Resource management plans

During collection it is essential to gather complete information required for cataloging specimens. The Museum Catalog Worksheet-NH (Form 10-254D) may be used during field work for documenting pertinent data on-site, thus assuring that the collector has recorded all pertinent ANCS-related data.

For standard cataloging procedures, refer to the NPS Museum Handbook, Part II, Chapters 3 and 4, Appendix H, and the ANCS User Manual.

D. Classifying Specimens Using the Hierarchical Classification Outline (HCO)

Standard taxonomic nomenclature or terminology for park natural resource collections is essential for retrieval of information from the ANCS. The HCO was specifically developed by the NPS to provide a standardized Servicewide taxonomic classification and nomenclature for cataloging natural resource museum specimens.

Refer to the NPS Museum Handbook, Part II, Appendix H, for the HCO and instructions for its use. Consult the regional curator for additional information.

III. Preservation of Collections

The preservation of natural resource specimens begins with field collecting techniques. Collecting biological specimens involves several steps that include techniques for killing, fixing, mounting, and preserving. The methods for preserving specimens depend on the intended use (e.g., research, exhibit). It is essential for the collector to provide park curatorial staff with documentation on the techniques and materials used in the field collecting activity. Proper maintenance of the specimens depends on this information.

Natural resource specimens are subject to deterioration from improper levels of relative humidity, temperature, and light; from insects, mold, and other pests; and from improper handling, storage, and exhibit techniques. The task of preserving specimens can be accomplished by practicing preventive conservation. An ongoing preventive conservation program ensures that the specimens are stored and/or exhibited in appropriately controlled environments with adequate protection against improper handling, pests, disasters, and theft. In addition, collections need to be examined periodically, both for accountability purposes and to detect any active deterioration.

Preventive conservation includes storing specimens and associated documentation in a dedicated storage space. Museum storage areas should be single purpose spaces having controlled access. A dedicated storage space facilitates control of the environment and ensures proper security. A stable climatic environment requires that the space be monitored and controlled to ensure maintenance of proper levels of temperature, relative humidity, and light. A controlled environment also reduces biological infestation, dust, and other airborne pollutants.

Proper security protects specimens and associated documentation from theft, fire, unauthorized use and improper handling. Museum specimens can illustrate the existing biological diversity of each park. This diversity can change and the collections may be the only measurement of those changes. Natural resource museum specimens cannot be replaced.

Preservation of specimens and associated documentation also may include conservation treatment. When collections need more than preventive conservation, the treatment must be performed by a qualified conservator.

Refer to Special Directive 80-1 and the associated NPS Inspection Checklist for Museum Storage and Exhibit Spaces for NPS standards and requirements for preserving and protecting NPS museum collections and to the NPS Museum Handbook, Part I, for detailed guidance on museum collections storage and environment, conservation treatment, security, fire protection, emergency management, and curatorial health and safety issues. The NPS Conserve O Gram series also provides guidance on care and maintenance of collections.

IV. Use of Collections

Research is the primary use for systematic natural resource collections. Permission to conduct research on existing museum collections may be granted to qualified individuals and/or institutions upon approval of a written research proposal submitted to the park superintendent. The proposal must outline the purpose, methods, and expected results. The researcher must agree to abide by the park's or center's written procedures for access to and use of the collection. Copies of all reports or publications resulting from a research project must be filed with the park. All research/project documentation is managed as part of the park's museum collection. For most research purposes, use of the collections at the park is preferable. Work space, staff assistance for retrieval of specimens and records, and equipment use is provided to the extent possible. Off-site use may be provided through a loan to a qualified institution. Refer to the NPS Museum Handbook, Part II, for procedures relevant to outgoing loans.

Detailed locality information of extremely fragile natural resources or those subject to vandalism should not be included in final studies and reports for public distribution and should not be recorded on specimen labels or catalog cards. Decisions made regarding dissemination of locality information should be documented.

Exhibits, films and videos, publications (e.g., books, posters, cards, maps) and the production of models, casts, and reproductions are possible interpretive uses of park natural resource museum collections. The only limitation to use is that the materials in the collections must be maintained in a way that prevents or minimizes damage or loss.

Natural resource specimens used in a park exhibit provide visitors an opportunity to view the park's natural resources. Besides assisting in identification of park flora, fauna, and rocks and minerals, specimens help illustrate geological and ecological concepts and communicate important park

resource management issues. Specimens made available for traveling exhibitions may be loaned to other parks or qualified non-NPS institutions.

Publications benefit from photographs of natural resource specimens. Photographs are a nonconsumptive and wide-reaching use of specimens. Books and magazines, photographs, videotapes, films, slides, postcards and stationery, posters, and models and casts of specimens can be used to further explore the resources and purposes of each park in more depth. Results of scientific research can be published to share information relevant to a park's natural and cultural resources with the scientific community.

Natural resource museum collections may also be used to train resource management specialists, interpreters, researchers, park staff, individual students and school groups, as well as the general public. Representative, systematic collections can be used to provide detailed knowledge of the flora, fauna, and geology of a park.

ROLES AND RESPONSIBILITIES

I. Park

The responsibility for managing museum collections is greatest at the park level. The **superintendent** is responsible for the accountability, preservation, protection, and use of the site's museum collections. The superintendent ensures that all research projects generating museum specimens include funding to ensure that the cataloging and the initial preservation and storage requirements are accomplished. The superintendent recommends or approves all planning documents that are related to the proper management of the museum collections. The day-to-day care for a park's collection is delegated by the superintendent to the **park curatorial staff**. Park curatorial staff may also undertake the responsibility of researching and interpreting the collection. The curatorial staff must be involved in reviewing specimen collecting activities, including permit requests, to insure that NPS curatorial requirements are met.

II. Region

The **regional curator** is responsible for providing support and management oversight to assist parks in implementing the policies and procedures for managing museum collections. The regional curator works with the Curatorial Services Division in developing, reviewing, and implementing Servicewide curatorial policies and procedures; assists in the planning, programming, and budgeting for collections management; and facilitates curatorial training and technical assistance. The regional curator works with the **regional chief scientist** to coordinate curatorial matters relevant to natural resource collections.

III. Washington Office

The **Curatorial Services Division**, in the Washington Office, develops and coordinates Servicewide policies, standards, and procedures for the management of NPS museum collections, including cultural and natural materials. The **Wildlife and Vegetation Division** provides technical support to the Curatorial Service Division in matters relating to natural materials. The Curatorial Services Division is responsible for coordinating the development of new and revised policy and guidance documents (e.g., NPS Museum Handbook), coordinating and implementing the Automated National Catalog System and maintaining the centralized records of the National Catalog, developing and conducting curatorial training, coordinating the production of collection management plans, producing NPS Conserve O Grams and technical assistance on storage and maintenance of museum collections, maintaining product information on curatorial supplies and equipment, coordinating a program to facilitate purchases and loans of equipment, and operating the NPS Clearinghouse to assist parks in acquiring and disposing of museum objects. The **NPS Natural History Collections Committee** serves as a standing committee of Servicewide natural science specialists and curators to advise the Curatorial Services Division on policy issues and the planning, management, and use of natural resource museum collections.

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CERTIFICATION

The purpose of this section is to delineate programs for which certification is required and/or is available for NPS natural resource management personnel, NPS and cooperating researchers and scientists, and other NPS personnel involved in natural resource management or resource protection activities or involved in specialty fields. Certification requirements are outlined for the following fields related to natural resources management: firearms use, chemical immobilization, pesticide application, wildland fire, SCUBA, aircraft use, and operation of boats. Certification in first aid is referenced in Relationship to Other Guidance, below.

DEFINITIONS

Aircraft Light or heavy, single, or multi-engine airplanes and helicopters.

Certification Receiving documentation stating that one has completed minimum requirements and/or training to practice a field of work.

Controlled substance A drug or other substance or immediate precursor included in Schedules I, II, III, IV, or V, or Part B of the Controlled Substance Act (21 USC 812).

Firearms Any pistol, rifle, shotgun, or other weapon that is designed to, or may be readily converted to, expel a projectile by the ignition of a propellant, compressed gas, or spring-powered pistol or rifle, bow and arrow, or crossbow, including capture and immobilization weapons and net-guns used in the restraint and capture of wildlife. Paint pistols or rifles (designed to expel paint pellets using compressed gas or by the ignition of a propellant) are **not** to be defined as firearms/weapons.

First aid The provision of emergency medical care administered to sustain a patient until advanced life support is available.

Immobilization agent Any substance that demonstrates the ability to tranquilize, immobilize, anesthetize, paralyze, or sedate any species of invertebrate or vertebrate animal.

Pesticide Any substance or mixture of substances intended to prevent, destroy, repel, or mitigate any defined pest, or intended for use as a plant regulator, defoliator, or desiccant.

Practitioner A physician, dentist, veterinarian, scientific investigator, pharmacy, hospital, or other person licensed, registered, or otherwise permitted in the U.S. or the jurisdiction in which such a person practices to distribute or possess a controlled substance in the course of professional practice.

SCUBA An underwater diving mode independent of surface air supply in which the diver uses open circuit self-contained underwater breathing apparatus.

Sterilization agent Any substance (as opposed to a surgical procedure) that has been demonstrated to effectively render plants or animals incapable of successfully producing offspring, either temporarily or permanently.

POLICY AND PROGRAM OBJECTIVES

The National Park Service encourages employees involved in natural resource management to maintain the highest standard of training and performance in all their fields of endeavor. The basis for certification is to ensure that personnel are adequately trained in specialty fields, and that there is a recognizable **minimum** level of training and performance to be expected from each participant in those fields. It is not implied that all resource managers should attain certification in each of these fields; however, if resource management staff perform duties in fields where there are required certification standards they must obtain and maintain qualification commensurate with those standards. In many fields, standards relating to resource management application are specified in other guidelines; these are herein referenced and must be adhered to by all NPS personnel.

Professional certification is offered by scientific societies in various scientific disciplines (e.g., fishery biology, forestry, ecology, etc.). It is occasionally useful regarding NPS testimony in litigation proceedings and is generally taken as evidence of an employee's competence and professional growth.

AUTHORITIES

Specific authorities supporting certification requirements in fields that pertain to natural resource management include 29 CFR Part 1960 and Executive Order 11752 (Pesticide Application Program); Departmental Manual 910 (Wildfire Suppression); DEA Regulation 21 CFR 1301.71 to 1301.75, 21 CFR 1304, and 36 CFR 2.35 (Use of Chemical Immobilization Agents that are Controlled Substances); 41 CFR 114-38.5508 (Watercraft Training), and Departmental Manual 350-354 (Aviation Management). In addition, the Hazardous Waste Operations and Emergency Response rule (29 CFR 1910.120), issued by the Occupational Safety and Health Administration, requires that persons that handle hazardous waste, including oil spills, receive appropriate training based upon their area and level of responsibility.

RELATIONSHIP TO OTHER GUIDANCE

Other guidelines that pertain to certification programs include NPS-4, the Diving Management guideline; NPS-9, the Law Enforcement guideline; NPS-18, the Fire Management guideline; NPS-51, the Emergency Medical Services guideline; NPS-44, the Personal Property Management guideline; Special Directive 88-2, First Aid and CPR Certification Requirements; NPS-60, the Aviation Management guideline; and DM 350-354, Aviation Management.

See also in this Guideline, Chapter 2, Native Animal Management, Integrated Pest Management, and Fire Management; and Chapter 5, Employee Development and Training.

PROGRAM GUIDANCE

I. Certification Standards for Natural Resource Management Personnel and NPS and Cooperating Researchers

A. Aircraft

Resource management personnel often need to use aircraft to perform their duties, whether it be for fire monitoring and management, aerial surveys of wildlife, mapping, radio-telemetry, animal capture, or pesticide application. The Department of the Interior has established an Office of Aircraft Services (OAS) that is responsible for aviation safety in the agency. The primary objective is the elimination of risks associated with the use of aircraft in the execution of Interior programs.

All NPS units and their resource management staff must comply with regulations and training standards documented in DM 350-354 and the associated OAS Operational Procedures Memorandum. Aircraft, pilots, observers, and gunners must comply with certification, qualifications, and training specified in DM 350 and in NPS-60, the Aviation Management guideline.

B. SCUBA

NPS units with suitable aquatic resources may have diving management programs, either for visitors or staff or both. Dives undertaken by employees, regardless of their purpose, must be conducted in a manner most likely to minimize accidental injury or occupational illness.

NPS-4, the Diving Management guideline, specifies that each affected unit have a diving safety plan and also maintain a list of qualified divers on the staff. Training and certification requirements for divers are specified and outlined in NPS-4.

C. Boating

In NPS units using and operating boats, **minimum** training and certification requirements consist of either:

1. completion of the U.S. Coast Guard Basic Seamanship Course, or

2. completion of the U.S. Power Squadron Course, or

3. completion of a 40-hour equivalent boating course.

Superintendents may require additional training for the operation of boats in their respective units.

D. Pesticides

NPS personnel may need to apply pesticides in the course of solving park pest management concerns. NPS policy (Management Policies 4:14) states that pesticides will be used only where feasible alternatives are not available or acceptable, and that, regardless of who the applicator is, all use shall be approved by the Director on an annual basis. It is Department policy to use pest management research, control, education, and assistance programs to develop, support, and adopt integrated pest management (IPM) strategies.

Resource management personnel involved in IPM programs and application must be qualified as, or supervised by, a certified pesticide applicator. See Chapter 2, Integrated Pest Management, for details on certification of pesticide applicators.

E. Wildland Fire

NPS units are required to have fire management plans that outline resource objectives of that unit through preventing human-caused wildfire, minimizing negative impacts from wildfires that occur, and guiding the use of prescribed fire in a manner that minimizes risk to the lives and property of employees, visitors, and park neighbors. To accomplish fire management objectives requires the use of personnel trained and certified according to the National Interagency Incident Management System (NIIMS). The NPS Wildland Fire Qualification System provides and certifies NPS employees with training and experience to fill positions in the Incident Command System.

Specific training and certification requirements for suppression fire management positions are detailed in NIIMS Publication 310-1, Wildland Fire Qualification Guide, as enhanced by NPS. Each park must determine and document its position needs and schedule training as required for personnel to meet the NIIMS and NPS qualifications. For example, if a resource management specialist is also designated as a prescribed burn boss, then the resource management specialist must be qualified and trained to meet the NPS standard for that fire position.

Regional and park managers may require additional training and certification for personnel involved in wildland fire duties.

F. Firearms and Ammunition

Within the natural resource management program employees may be required to use firearms as a tool during official management activities such as live capture, destruction, sterilization, marking, or other wildlife activities; or for the general safety of the resource manager. In fulfilling these resource obligations requiring the use of a firearm, employees must keep visitor and employee safety paramount. The wearing, carrying, using, and protection of firearms placed in an employee's care is a tremendous responsibility. In addition, the employee and the NPS are liable for any misuse of a firearm, for whatever reason (accidental discharge, lack of training, inexperience, etc.). Considering the hazards and the potential element of danger inherent in the use of firearms, all

persons engaged in natural resource management activities requiring the use of a firearm must be properly trained, qualified, and equipped. This includes the use of capture and immobilization weapons used in the course of research or management activities within any unit of the System. These standards apply to all persons operating or using weapons (firearms) in any unit of the System, including volunteers, students, state wildlife wardens, scientists, or other cooperative employees sanctioned to work within the park.

These standards should be considered **minimum standards.** Superintendents are encouraged to establish and require stricter training and qualifications tailored to the specific needs of the park.

1. Acquisition and Storage

The acquisition and storage of firearms and ammunition must be in accordance with regulations and requirements set forth in NPS-44, the Personal Property Management guideline. The types and calibers of firearms and special capture/restraint firearms to be acquired and maintained must be determined by the superintendent and approved by the Regional Director.

2. Training

The NPS requires firearms training for all employees authorized to possess or use firearms in the performance of their natural resource management duties. The training, however, must be relevant to each employee's assignment and duties and must include training in all types of firearms assigned to or to be used by the employee.

Firearms training must include safety, marksmanship, maintenance, storage, performance, limitations of capture and restraint firearms, accountability and control, security, and preservation measures. An appropriate amount of time should be scheduled to cover these subjects prior to qualification. The classroom portion of the training involving capture/restraint firearms may be taught by any person with the knowledge, skill, and experience to cover the subject matter adequately.

3. Qualification

All employees whose duties require the use of firearms must qualify at a **minimum** semi-annually with the type of firearm(s) to be used. Seasonals, temporaries, and cooperators appointed for less than 6 months need only qualify annually. If a firearm is to be used under reduced light conditions, qualifications shall include an additional reduced light course. Qualification standards for firearms have not been established except for law enforcement duties. Specific qualifications for firearms, excluding law enforcement, is delegated to the superintendent. Superintendents, in consultation with the park's firearms officer and wildlife program manager, must establish approved courses of fire for qualification with firearms. For firearms other than the special capture/restraint weapons, it is recommended that the **minimum** course of qualification be identical to the requirements of NPS-9, the Law Enforcement guideline. Minimum standards for the special capture/restraint firearms qualification course focus on the weapons (CO_2, compressed gas, pow-

der/cartridge detonator) used in these activities; and will vary depending on the special weapon being used. Superintendents are delegated authority to establish minimum qualification courses of firearms.

Since capture/restraint firearms and immobilization drugs should never be used in emergency situations and because of the extreme danger from accidental injections to humans, it is inappropriate for the loading of drugs to be included in the qualification course. The selection of the proper drug dosage, syringe size, and powder charge or rifle setting should be covered in the chemical immobilization training.

G. Chemical Immobilization and Sterilization Agents

1. General Information

NPS resource management and research programs may necessitate the use of chemical immobilization and/or sterilization agents to accomplish wildlife research or management objectives. Only accepted methods and techniques to capture, restrain, or handle wildlife, with the utmost emphasis on the humane treatment and welfare of both the animal and humans present are to be used.

Chemical substances should not be viewed as the only means for the capture and/or restraint of wildlife, but only as one tool that may be used to accomplish park purposes. Chemical substances and the methods used to administer them require highly specialized training and care. Almost all of these substances are regulated by other federal agencies. The Drug Enforcement Administration (DEA) regulates the use of controlled substances. The Food and Drug Administration (FDA) regulates the use of drugs in terms of their safety, efficacy, and effect on domestic and wild animals that may be consumed.

Many immobilization agents that have been and are currently used to immobilize/restrain wildlife have not been either tested or approved by FDA. However, in general they allow the judicious use of these chemical substances to immobilize or restrain wildlife when done by professionals in wildlife management. Each park should set the highest standards of training, qualification, and certification in the use of chemical substances for wildlife management programs.

2. Training and Program Standards

All NPS personnel and cooperators engaged in any activity that involves the use or the administration of chemical immobilization or sterilization agents must have documented **minimum** training standards. Completion of required training does **not** qualify or certify an employee or individual to use/administer chemical substances. Superintendents or their designated representative are responsible for the certification of employees or cooperators within their park. Superintendents are encouraged to establish stricter and/or additional training and qualification standards tailored to their particular needs.

Sterilizing agents and/or experimental drugs are regulated by 21 CFR 511ff, and allowed only after New Animal Drugs for Investigational Use (INAD) permits have been issued by the FDA. These agents should be used only by accredited researchers following approved research protocols. Requests for INAD permits should be directed to:

Center for Veterinary Medicine
Food and Drug Administration
5600 Fishers Lane
Rockville, Maryland 20857

3. Minimum Training Standards

Each park that has a need to use chemical immobilization or sterilization agents for wildlife research or management must develop an operational plan for such a program. NPS staff or cooperative personnel involved in such wildlife research or management programs must at a minimum attend and complete or document that they have the following training:

a. 8 hours classroom training in drug pharmacology, symptomology, wildlife response, animal safety, monitoring;

b. 2 hours ethics, public relations, record-keeping, and NPS policy;

c. current CPR certification;

d. 2 hours human safety and emergency procedures;

e. 4 hours loading of darts, dosage calculation, handling and storage of drugs, equipment familiarization, and trouble shooting; and

f. 8 hours of supervised field captures/immobilization.

The NPS Firearms-Chemical Immobilization training course provides an individual with the necessary **minimum** training requirements. Other training programs similar in nature may be sponsored by parks, regions, colleges, or other state and federal agencies to meet the above requirements.

Each park with a need to obtain, store, and/or use controlled substances must obtain a Park Practitioner License from DEA and designate a park practitioner. Requirements for obtaining the Park Practitioner's License are:

a. The park must have an operational plan stating the objectives of such a program and its methodology and setting forth a training and certification program for the use of any scheduled or unscheduled drugs.

b. The training and certification program must, at a minimum, require a person to have:

   1) 8 hours formal training in drug physiology, wildlife response, symptomology ,and monitoring, and

   2) at least 16 hours of on-the-job training in preparation, administration, and recovery patterns of immobilization drugs.

c. Such person can, upon proof of having met the qualifications, be certified by the superintendent as a "practitioner," within the language of 36 CFR, subject to all other federal and state laws, regulations, and requirements.

d. The park must acquire a storage safe meeting the requirements of DEA's regulation 21 CFR 1301.71 to 1301.75 and must agree to fully comply with such licensing, recordkeeping, and storage requirements as might be imposed by DEA's regulations, found at 21 CFR 1304.

The park practitioner is responsible for the acquisition, storage, dispensing, and security of all controlled and uncontrolled substances used for wildlife chemical immobilization programs as well as all records relating to the use and inventory of these substances.

The park practitioner must not obtain, transfer, or dispense chemical immobilizing or sterilizing agents to unqualified park or cooperative personnel. Cooperators and/or contract personnel may be responsible for obtaining, securing, and using their own supplies of chemical immobilizing or sterilizing agents, in accordance with federal and state laws, DEA and NPS regulations, and 36 CFR 2.35. They must comply with NPS and park standards, procedures, and training requirements when working under the auspices of park research or management programs.

ROLES AND RESPONSIBILITIES

I. Park

The primary role of the **superintendent** is to ensure that guidelines are incorporated programmatically into park operations, and that staff are held accountable for complying with all standards and guidelines set by the Service for the benefit of all operations. Except where otherwise established, the superintendent is responsible for certifying his or her personnel as qualified to perform duties for which a training standard and/or certification is available.

The primary role of the **resource manager** is to plan and carry out needed natural resource management programs in a safe and effective manner. With regard to certification and training requirements guidelines, the resource manager's role is to acquire this training and/or these certifications for himself and those working under his supervision.

II. Region

Regional office program managers ensure that programs planned or supervised from the regional office use trained and certified employees to carry out resource management programs. **Regional Directors** ensure that standards are uniformly applied to all parks within their region, and that training funds and courses are available commensurate with the demands and needs for training and certification of personnel.

III. Washington Office

Washington Office program managers support the uniform application of standards and provision of training courses to meet the needs and demands of all field units. They should maintain an inventory of personnel who meet various certification qualifications in resource management and specialty fields, and further work toward increasing the overall training and qualifications of resource management personnel in the Service. Except where otherwise established, they do not directly certify personnel as qualified in various fields of specialty.

The Washington Office **Directorate** provides an atmosphere in which the various regions and parks are encouraged to adopt uniform standards and certification where appropriate, and ensures that training courses and funds are available commensurate with training requirements, needs, and demands. Required Servicewide training and certification requirements should not be implemented without considerable input from field units. They should emphasize the Servicewide benefits that may be gained by standardizing personnel requirements in resource management and specialty fields.

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EMPLOYEE DEVELOPMENT AND TRAINING

The purpose of this section is to describe the types of employee development activities appropriate to NPS employees with different degrees of involvement in natural resource management. Since almost all NPS employees, no matter what their individual jobs, participate to some degree in the fundamental mission of the NPS to manage and protect resources, all employees should have some minimal level of knowledge about NPS natural resource management goals and programs.

DEFINITIONS

Employee development The overall process used to build and maintain a cadre of employees who are skilled in performing their present jobs, cognizant of pertinent new developments, and prepared for advancement into positions with greater responsibility. Correspondence studies, on-the-job training, short-term details into other jobs, training courses, seminars, and any other organized activity intentionally designed to improve the ability of an employee to meet a need of the Service could constitute an appropriate employee development experience.

POLICY AND PROGRAM OBJECTIVES

The NPS seeks to provide for and sponsor employee development activities to supplement each employee's prior education and ongoing self-improvement efforts, and to assist employees in developing the new skills, knowledge, or abilities necessary for their overall performance as NPS employees. The general goal of employee development in resource management is to provide every employee with the appropriate levels of knowledge and skill necessary to ensure the best possible protection, preservation, restoration, scientific research, and informed communication concerning both natural and cultural resources. In general, the levels of development necessary to reach this objective are as follows:

- Every employee whose duties indirectly affect natural resource management activities or programs should be given, at the minimum, instruction sufficient to ensure a basic understanding of NPS resource management policies, goals, and procedures, and the significance of their own role in the Service's resource management program.

- Employees who directly participate in conducting scientific research and in planning, implementing, supervising, monitoring, or assessing NPS resource management programs or activities should be given, through an appropriate blend of formal education, refresher courses, specialty courses, on-the-job training, or other development opportunities, whatever development experiences are necessary to ensure that they have the knowledge, skills, and abilities to perform their professional duties in a satisfactory manner.

- Managers, and Washington and regional office staff, should be given initial and periodic refresher instruction or training to make them aware of current strategies for

implementing effective resource management programs and to keep them abreast of recent changes of law, regulations, and policy governing NPS resource management.

AUTHORITIES

Basic authorities supporting the training and development of federal employees include 5 USC 4101 et. seq. (formerly known as the Government Employees Training Act); Executive Orders 11348, dated April 20, 1967, and 12107, dated December 28, 1978; and 5 CFR 410. Additional authorities are contained in the Federal Personnel Manual, chapter 410 (Training); the Departmental Manual 370 DM 410 (Training); and NPS FPM 410 (Training).

RELATIONSHIP TO OTHER GUIDANCE

Other guidelines that contain training requirements potentially applicable to specialized aspects of resource management duties include NPS-4, the Diving Management guideline; NPS-9, the Law Enforcement guideline; NPS-18, the Fire Management guideline; NPS-28, the Cultural Resources Management guideline; NPS-44, the Personal Property and Management guideline; and NPS-60, the Aviation Management guideline.

In this Guideline, see Chapter 2, Integrated Pest Management, and Chapter 5, Certification.

PROGRAM GUIDANCE

NPS employee development opportunities designed and offered in individual parks or by regional offices, as well as courses or programs coordinated Servicewide, are ways employees can get developmental experiences necessary to prepare them to meet their level of responsibility in resource management. However, courses, workshops, or conferences cosponsored with or offered by other agencies, or by universities and private organizations, may be an alternative way for an employee to get training specific to an identified need. Participation in such opportunities will be encouraged.

Requests for specific natural resource management development or training, to the level required for each employee's job, should be included on his or her Employee Development Plan (EDP), NPS Form 10-224. Supervisors have the dual responsibilities of ensuring that each employee has an appropriate, current EDP, and also of assisting the employee in obtaining the needed developmental activities.

Formal certification may be required before an employee is permitted to perform some natural resource management duties. Training necessary to qualify for such certification is described in this chapter in the section on Certification. Because course offerings vary from year to year, and because new courses are continually being developed and existing ones revised, it is not feasible to promulgate a general requirement that all employees having a particular level of natural resource

management duties should attend a particular course or set of courses before being permitted to perform those duties. However, general recommendations are possible.

Every employee, as soon after employment as possible, should be given instruction which explains the Service's resource preservation mission, defines resource management, and explores how his or her duties relate to resource management. The course, Orientation to NPS Operations, includes a brief, general treatment of what NPS resource management entails. Orientation to the Management of NPS Resources provides a broader overview of the various facets of natural and cultural resource management and specifically covers the role each employee should play if resource management programs are to be fully successful. Ranger Skills, which is offered to new, uniformed employees, primarily in the GS-025 Park Ranger job series, who have jobs requiring contact with the public, also contains a segment on the laws, policies, and principles of natural and cultural resource management. Training programs for seasonal employees should include resources management issues where appropriate.

Employees with either collateral or primary duties in natural resource management, including scientists and resource managers, should be encouraged to participate in a variety of courses, workshops, conferences, or seminars which focus on the professional skills and knowledge required to conduct research and plan, implement, and evaluate natural resource management tasks and projects. Such opportunities are frequently offered by organizations other than the NPS. A few examples of appropriate NPS course topics include wildlife management, fisheries and aquatic systems, wildlife law enforcement, vegetation management, air quality, water quality, integrated pest management, and natural resources law and policy. Resource managers should attain knowledge and skills in as many aspects of ecology as possible, not just their own defined job area or specialization, since effective management of park ecosystems depends on the integration of principles from all areas of ecology.

Employees early in their NPS careers who already have a general academic background in natural science and who occupy or intend to seek positions requiring broad natural resource management knowledge should consider applying to enter the Natural Resources Management Trainee Program. Trainees attend a core curriculum of courses on natural resources and related topics, including those mentioned in the preceding paragraph, and pursue additional development tailored to the background and job requirements of the individual participant.

Courses or workshops appropriate for superintendents and staff with general oversight responsibilities for natural resource management should focus on selected topics such as critical natural resource issues, air quality, and water rights, as well as natural resource management overview courses directed at superintendents.

ROLES AND RESPONSIBILITIES

I. Park/Office

Managers and supervisors bear the general responsibility for determining what development is needed by each employee and identifying employee development experiences necessary to ensure that employees can satisfactorily carry out their duties. This task is most easily accomplished as the employee and supervisor complete an annual EDP during the performance appraisal process. As part of this process, each employee is responsible for establishing realistic career goals, for considering NPS as well as personal needs when requesting development, and in making a concerted effort toward independent self-improvement. Managers and supervisors also have the responsibility to plan and conduct on-site and on-the-job training where feasible. Each park or office should have a **unit employee development coordinator** appointed to serve as liaison with regional and Washington office employee development personnel, to distribute notices of development opportunities within the unit, and to assist individual employees as they complete applications (e.g., SF 182) to attend a particular course.

II. Region

Regional employee development officers (including those representing the Denver Service Center, Harpers Ferry Center, the Williamsport Preservation Training Center, and the Washington Office) have the responsibility to work with managers, supervisors, and employees to locate or design and present developmental activities which meet identified needs. They serve as a point of contact for individual employees who seek counsel on employee development appropriate to their jobs. These employee development officers make use of the information from EDPs as they plan courses.

III. Washington Office

The **Employee Development Division** in the Washington Office has the primary staff responsibility to use input from all sources, including individual employee EDPs, to determine Servicewide employee development needs and formulate a plan to meet the highest priority needs. The **Associate Director, Natural Resources**, advises the Employee Development Division on what natural resources subject matter, courses, or programs should be given priority consideration. The Albright and Mather Employee Development Centers develop, schedule, and conduct the majority of the Servicewide training courses, including natural resource management courses. Basic and advanced law enforcement training programs, many of which include natural resource protection components, are coordinated by the Federal Law Enforcement Employee Development Center (NPS/FLETC).

APPENDIX A: LAWS, EXECUTIVE ORDERS, AND PRESIDENTIAL DIRECTIVES REFERRED TO IN THIS GUIDELINE

LAWS

Acid Precipitation Act of 1980
(PL 96-294 Title VII, 94 Stat 770, 42 USC 8901 et seq.)

The purpose of this act is "to identify the causes and sources of acid precipitation;" and "to evaluate the environmental, social, and economic effects of acid precipitation." It calls for a comprehensive 10-year program to be implemented by the Interagency Acid Precipitation Task Force.

Alaska National Interest Lands Conservation Act of 1980
(PL 96-487, 94 Stat 2371, 16 USC 3161 et seq.)

This act added to or expanded existing units of the five national conservation systems in the Alaska National Park System, National Wildlife Refuge System, National Wild and Scenic Rivers System, National Wilderness Preservation System, and National Forest System. Five national parks were established; three existing parks were expanded, two of which had been monuments; two national monuments were established; 10 national preserves were established, which are administered as parks except that sport hunting and trapping are authorized in them; and 13 of the wild and scenic rivers established (all designated "wild") were put under NPS administration. The act more than doubled the size of the National Park System by adding over 50 million acres.

Antiquities Act of 1906
(PL Chapter 3060, 34 Stat 225, 16 USC 431-433)

This act authorizes the President to declare national monuments to protect sites and objects; authorizes federal departments to grant permits for survey and excavation and for gathering of "objects of antiquity" and to enforce protection of archeological sites and objects under their jurisdiction; and requires that materials excavated be permanently preserved in public museums.

Archaeological Resources Protection Act of 1979
(PL 96-95, 93 Stat 721, 16 USC 470aa-ll)

This was enacted to prevent the illegal excavations and possession of archeological resources located on federal, other public, and Indian lands. In passing this act the Congress recognized that the only comparable statutory law, the 1906 Antiquities Act, was inadequate in terms of defining archeological resources and establishing appropriate penalty provisions. The act called for regulations to be promulgated jointly by the Secretaries of Interior, Agriculture, Defense, and the Chairman of the Board of the Tennessee Valley Authority.

Bald and Golden Eagles Protection Act
(PL Chapter 28, 54 Stat 250, 16 USC 668 et seq., as amended)

This statute prohibits taking, possession, and trade in bald and golden eagles. It originated by act of Congress in 1940, with only bald eagles given protection at that time. An amendment in 1962 gave the same protection to golden eagles. A third amendment in 1973 provided increased criminal penalties and made second and subsequent offenses felonies. The act provides federal protection for bald and golden eagles; provides for civil or criminal penalties for violations and a reward for informers; authorizes cancellation of grazing, leases, licenses, permits, or other agreements for violations; and provides for the possession and transport of golden eagles for falconry, under certain conditions.

Clean Air Act
(PL chapter 360, 69 Stat 322, 42 USC 7401 et seq.)

The main purpose of this act is to protect and enhance the nation's air quality to promote the public health and welfare. The act establishes specific programs that provide special protection for air resources and air quality related values (AQRVs) associated with NPS units. For example, sections 160-169 of the act establish a program to prevent significant deterioration (PSD) of air quality in clean air regions of the country. The purposes of the PSD program include: to protect resources that might be sensitive to pollutant concentrations lower than the established national standards and "to preserve, protect and enhance the air quality in national parks, national monuments, national seashores, and other areas of special national or regional natural, recreational, scenic or historic value." In section 169A of the act, Congress also established a national goal of remedying any existing and preventing any future manmade visibility impairment in mandatory class I areas.

Clean Water Act
(see Federal Water Pollution Control Act)

Coastal Barrier Resources Act of 1982
(PL 97-348, 96 Stat 1653, 16 USC 3501 et seq.)

This established a "Coastal Barrier Resources System" that identifies and maps certain essentially undeveloped coastal barrier features (islands, spits, etc.) and their associated aquatic habitats along the Atlantic and Gulf of Mexico coastlines. The act restricts certain federal actions (e.g., construction of bridges, roads, docks, shoreline stabilization structures, etc.) or federal assistance for such actions in areas within the System. While such features managed by the NPS are not included in the System, listed areas may be adjacent to NPS units. The act was amended by the Great Lakes Coastal Barrier Act of 1988 to include coastal barriers in the shore areas of the Great Lakes.

Coastal Zone Management Act of 1972
(PL 92-583, 86 Stat 1280, 16 USC 1451 et seq., as amended,)

This act states a national policy to "preserve, protect, develop, and where possible, to restore or enhance the resources of the nation's coastal zones" (including Great Lakes areas), and to encourage and assist the states in implementing management programs to achieve wise use of land and water resources of coastal zones. Federal agencies are required to comply, as much as possible, with applicable, approved state coastal zone management programs. Indian tribes doing work in federal lands are treated as federal agencies for purposes of this act.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980
(CERCLA or Superfund)
(PL 96-510, 94 Stat 2767, 42 USC 9601 et seq.)

This was enacted to regulate the cleanup of hazardous or toxic contaminants at closed or abandoned sites. A fund available to states was established for cleanup of these abandoned sites. Superfund monies come from taxes levied on designated chemical feedstocks. The government can recover cost of the cleanup and associated damages by suing the responsible parties. The act was reauthorized in 1986 under the Superfund Amendment Reauthorization Act (SARA). Section 120 of SARA specifies that CERCLA is applicable to federal facilities.

Controlled Substance Act
(PL 91-513, 84 Stat 1242, 21 USC 812)

This act establishes five schedules for controlled substances and places them into the appropriate schedule based on findings. The act defines controlled substances; establishes five "schedules," or list of controlled substances, based upon the potential for abuse and use for accepted medical treatments; and specific substances to specific schedules. Substances listed as controlled are subject to federal regulatory control of their legal use.

Emergency Planning and Community Right-to-Know Act
(PL 99-499 Title III of SARA Sec. 300-330, 100 Stat 1725, 42 USC 1101)

This act set up procedures for (1) emergency planning, (2) emergency notification, (3) community right-to-know reporting on chemicals, and (4) emissions inventory. All federal agencies, including the DOI/NPS, are exempt from EPCRA. Nonetheless, DOI strongly encourages voluntary compliance with all portions of the law. EPCRA is designed to protect communities from hazardous chemicals by making sure that advance planning occurs for potential emergencies.

Endangered Species Act of 1973
(PL 93-205, 87 Stat 884, 7 USC 136, as amended)

This act requires federal agencies to ensure that their activities (authorized, funded, or carried out) will not jeopardize existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species.

Estuary Protection Act of 1968
(PL 90-454, 82 Stat 625, 16 USC 1221)

The purpose of this act is to provide a means for evaluating the nation's estuaries to achieve a reasonable balance between the need to protect their natural beauty and other resource values, and the need to develop them for further growth of the nation. Several agencies were directed by this act to jointly conduct a comprehensive study and inventory of estuaries, and to report (by Jan. 30, 1970) with recommendation on the feasibility and desirability of establishing a nationwide system of estuarine areas.

Federal Cave Resources Protection Act of 1988
(PL 100-691, 102 Stat. 4546, 16 USC 4301)

The purposes of this act are to identify and preserve significant caves on federal lands and to foster increased cooperation and information exchange between government agencies and others on the use of these caves for scientific, educational, and recreational purposes.

Federal Coal Leasing Amendments Act of 1976
(PL 94-377, 90 Stat 1083, 30 USC 201)

This act specifically prohibits coal leasing in units of the National Park System. It also requires the inclusion of a variety of environmental protection measures in coal leases issued under the mineral leasing acts of 1920 and 1947. This latter requirement helps to reduce the adverse impacts generated from coal development adjacent to parks.

Federal Environmental Pesticide Act
(see Federal Insecticide, Fungicide, and Rodenticide Act)

Federal Insecticide, Fungicide, and Rodenticide Act
(PL 92-516, 86 Stat 973, 7 USC 136 et seq.)

This act requires that all pesticides be registered, and that pesticides be used in accordance with the registration. The act restricts the use of certain pesticides. Some pesticides are regulated as toxic pollutants under the Clean Water Act and the Safe Drinking Water Act.

Federal Land Policy and Management Act
(PL 99-198, 99 Stat 1354, 43 USC 1732)

This act constitutes the organic legislation for the Bureau of Land Management (BLM). The act requires that BLM consider the resource management programs of other federal agencies on adjacent lands in conducting their resource planning. The act also contains a land exchange authority under which the Secretary may exchange federal lands or interests in lands outside NPS units for nonfederal lands or interest within NPS units. This method of exchange can be used to eliminate mineral interest in NPS units.

Federal Power Act of 1920
(PL Chapter 285, 41 Stat 106, 16 USC 791a et seq.)

The Federal Energy Regulatory Agency (FERC), under this act, is authorized to issue licenses for the construction, operation, and maintenance of dams, water conduits, reservoirs, power houses, transmission lines, and other physical structures of hydro-power projects. If such structures will affect the navigable capacity of any navigable waters of the U.S., the plans must be approved by the Chief of Engineers and the Secretary of the Army.

Federal Tort Claims Act
(PL Chapter 753 Title IV, 60 Stat 842, 28 USC 1346b, 2671-80)

This act provides the basis for the NPS to be held liable for failure or negligence with respect to visitor protection. Most interpretations of tort law make the landowner responsible for taking reasonable care to avert harm to visitors

Federal Water Pollution Control Act (Clean Water Act of 1972)
(PL 92-500, PL 100-433, 86 Stat 816, USC 9 sec. 1251 et seq., as amended, 33 USC sec. 1251-1376, and 1987 Federal Water Quality Act)

This act firmly establishes federal regulation of the nation's waters, and contains provisions designed to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." The act requires that the states set and enforce water quality standards to meet EPA minimum guidelines. It establishes effluent limitations for point sources of pollution, requires a permit for point source discharge of pollutants (through the National Pollution Discharge Elimination System), a permit for discharge of dredged or fill material, and authorizes a "National Wetlands Inventory." Recent changes brought about by the 1987 Federal Water Quality Act places greater emphasis on toxicological-based criteria and **in-site** biological monitoring.

Federal Water Power Act of 1920
(PL Chapter 285, 41 Stat 1063, 16 USC 823a, as amended, 16 USC 797, 41 Stat. 1353)

The 1921 amendments to the Federal Water Power Act prescribed that what is now the Federal Energy Regulatory Commission (FERC) could not grant authorization, permit, lease, or license for

any facilities (dams, reservoirs, power houses, etc.) for the development, storage, and transmission of water and/or power within a national park without specific authority from Congress. Exceptions are where a park's enabling legislation or other statute specifically provides for such activities, as in those parks established in conjunction with reclamation projects (Lake Mead, Glen Canyon, etc.)

Federal Water Project Recreation Act of 1965
(PL 89-72, 79 Stat 213, 16 USC 460(l)-12 to 460(l)-21)

In this act, congress established the policy that in the construction of water resource projects, full consideration is to be given to recreation and fish and wildlife enhancement. The act authorizes the federal government to pay up to one half of the costs of projects which have nonfederal public involvement, if the nonfederal entity(-ies) agree(s) to administer the project land and water areas for fish and wildlife and recreation enhancement, or both.

Federal Water Quality Act of 1987
(see Federal Water Pollution Control Act)

Fish and Wildlife Coordination Act
(PL 85-624, 72 Stat 563, 16 USC 661 et seq.)

This act requires federal agencies to consult with the U.S. Fish and Wildlife Service, or National Marine Fisheries Service, and with parallel state agencies, whenever water resource development plans result in alteration of a body of water. The Secretary of the Interior is authorized to assist and cooperate with federal agencies to "provide that wildlife conservation shall receive equal consideration and be coordinated with other features of water-resource development programs."

Flood Disaster Protection Act of 1973
(PL 93-234, 87 STAT 975, 12 USC 24, 1709-1)

This act substantially increased the coverage limits of the national flood insurance program. It also required state and local communities, as a condition of future federal assistance, to participate in the program and to adopt adequate flood plain ordinances and enforcement mechanisms. Property owners acquiring or improving land or facilities in identified flood hazard areas, and who are being assisted by federal programs (including by federally regulated or insured institution) are required to purchase flood insurance.

Food Security Act of 1985
(PL 99-198, 99 Stat 1354, 7 USC 1281)

Commonly known as the "Swampbuster Act," this legislation restricts a number of federal benefits to farmers who, after December 23, 1985, produce agricultural commodities on certain "converted wetland." Knowledge of the provisions of this law is useful for management of agricultural special use permits and in protecting park resources from impacts associated with agriculture on inholdings and adjacent lands.

Forest and Rangeland Renewable Resources Planning Act
(PL 95-307, 92 Stat 353, 16 USC 1600 et seq.)

This act established the land and resource management planning system for the U.S. Forest Service and also expressed Congressional insistence on inventory and monitoring of natural resources on all public lands in the U.S.

General Authorities Act of 1970
(PL 91-383 sec. 1., 84 Stat. 825, 16 USC 1a et seq.)

This act affirmed that all national park areas, including historic sites, recreation areas, etc., while acknowledged to be "distinct in character," were "united through their inter-related purposes and resources into one national park system as cumulative expressions of a single national heritage." The purpose of this act was "to include all such areas in the system and to clarify the authorities applicable to the system." The act made it clear that the NPS Organic Act and other protective mandates applied equally to all units of the system. Further amendments stated that NPS management of park units should not be conducted "in derogation of the purposes and values for which these various areas have been established."

Geothermal Steam Act of 1970
(PL 91-581, 84 Stat 1566, 30 USC 1001 et seq.)

Prohibits leasing of federally owned geothermal resources in all units of the National Park System, including the three units specifically open to mineral leases. The Geothermal Steam Act Amendments of 1988 provide added protection for selected parks by requiring BLM to obtain NPS consent before issuing a geothermal lease on lands adjacent to listed park units. The regulations at 43 CFR 3200 govern geothermal leasing on lands adjacent to park units.

Historic Sites, Buildings and Antiquities Act of 1935
(PL Chapter 593, 49 Stat 666, 16 USC 461 et seq.)

This established a national policy to preserve for public use historic sites, buildings, and objects of significance for the inspiration and benefit of the people of the United States. The act also directed the Secretary of the Interior to carry out wide-ranging programs in the field of history and placed with the Secretary responsibility for national leadership in the field of historic preservation. Another provision established the Advisory Board on National Parks, Historic Sites, Buildings, and Monuments (since renamed the National Park System Advisory Board). The act was the basis for the National Historic and Natural Landmarks Programs and the Historic American Building Survey.

Lacey Act
(PL Chapter 553, 37 Stat 187, 18 USC 42-44, as amended)

The Lacey Act was one of the first federal wildlife laws, passed in 1900 to outlaw interstate traffic in birds and other animals illegally killed in their state of origin. The Lacey Act has been amended several times and its coverage expanded to include wildlife taken in violation of foreign law as well as state law. The Black Bass Act of 1926 provided federal sanctions for the illegal interstate transportation of black bass taken, purchased, sold, or possessed in violation of state law. The Black Bass Act was subsequently expanded to cover all species of fish, and in 1969 was amended to encompass foreign commerce and fish taken, bought, sold, or possessed in violation of foreign law. The Lacey Act Amendments of 1981 combine the Lacey and Black Bass Acts into a single comprehensive statute to provide more effective enforcement of state, federal, Indian tribal, and foreign conservation laws protecting fish, wildlife, and rare plants. The act gives authority, in addition to CFR regulations, to park superintendents and the U.S. Attorney to prosecute criminal or civil violations involving the taking of wildlife, fish, and rare plants in park units.

Land and Water Conservation Fund Act of 1965
(PL 88-578, 78 Stat 897, 16 USC 460d et seq.)

This act established the Land and Water Conservation Fund for planning and purchase of outdoor recreation areas and facilities. Appropriations from the fund may be made by the Congress for allocation to (1) the states, on a matching basis, for planning, acquisition of land and water areas and for construction of outdoor recreation facilities; and (2) the federal agencies, including the National Park Service, for use in acquiring lands needed for outdoor recreation. Legislation in 1987 extended the Fund through 2015.

Magnuson Fishery Conservation and Management Act of 1976
(PL 94-265, 90 Stat 331, as amended, 16 USC 1801 et seq.)

The purpose of this act is to provide for the protection, conservation, and enhancement of the fisheries resources of the United States. It extended the exclusive fisheries zone of the United States from 12 to 200 miles effective July 1, 1976 and provided for the development of regional fisheries management plans and regulations to govern fishing within the fisheries zone and to provide control over anadromous fish to the extent of their range.

Marine Mammal Protection Act of 1972
(PL 92-522, 86 Stat 1027, 16 USC 1361 et seq.)

This act established a moratorium on taking and importing marine mammals and marine mammal products. Exceptions are allowed for specific, approved research and incidental taking in the course of certain commercial fishing operations. Any Indian, Aleut, or Eskimo who resides in Alaska and who dwells on the coast of the North Pacific Ocean or the Arctic Ocean is exempt from the moratorium on taking if such taking is for subsistence purposes or is done for purposes of creating

and selling authentic native articles of handicrafts and clothing, in each case accomplished in a nonwasteful manner.

The act also established a Marine Mammal Commission to make recommendations to federal agencies on marine mammal conservation and to make regulations on taking of marine mammals. The act assigned enforcement responsibilities to the Fish and Wildlife Service for manatees, polar bears, walruses, sea and marine otters, and dugongs; and to the National Marine Fisheries Service for members of the order Cetacea and members, other than walruses, of the order Pinnipedia.

Marine Protection, Research, and Sanctuaries Act (1972)
(PL 92-532, 86 Stat 1052, 16 USC 1431-1464, as amended)

This act authorizes the Secretary of Commerce, after consultation with other appropriate federal agencies, and approval of the President, to designate as marine sanctuaries those areas of the ocean waters, of the Great Lakes and their connecting waters, or of other coastal waters to preserve or restore such areas for their conservation, recreational, ecological, or aesthetic values. The act requires certification by the Secretary of Commerce before any activity within a designated marine sanctuary can be carried out. It provides an opportunity unique under U.S. law to manage offshore areas as ecosystems rather than managing for individual resources such as fisheries or mammals.

Migratory Bird Conservation Act
(PL Chapter 257, 45 Stat 1222, 16 USC 715 et seq.)

The purpose of this act is to aid in the restoration of scarce or extinct species and to regulate the introduction of American or foreign birds or other animals.

Migratory Bird Treaty Act of 1918
(PL 186, 40 Stat 755)

This act prohibits taking, possession, and trade of migratory birds, except as permitted by regulations released by the Secretary of Agriculture. The act provides search, arrest, and seizure authority to authorized USDA employees; provides for civil and criminal penalties for violation; allows states to impose more restrictive measures to protect migratory birds; and allows for taking for scientific and propagating purposes.

Migratory Game Fish Study Act of 1959
(PL 86-359 Title I, 73 Stat 642, as amended, 16 USC 760 e)

This act directed the Secretary of the Interior to undertake a research program on the habits of migratory game fish in coastal waters of the United States. The act requires that in studying environmental influences on various species of fish, attention should be directed to artificial as well as natural environmental factors. (Note: Responsibility for carrying out the provisions of this act

were transferred to the Secretary of Commerce by Reorganization Plan No. 4 of 1970, 35 FR 15627, 84 Stat. 2090).

Migratory Marine Game-Fish Act
(PL 86-358, 73 Stat 643, 16 USC 760c-760g)

This act expresses the will of Congress to protect the quality of the aquatic environment as it affects the conservation, improvement, and enjoyment of marine fish and wildlife resources.

Mineral Leasing Act for Acquired Lands of 1947
(PL Chapter 681, 61 Stat 681, 30 USC 351 et seq.)

This act authorized the disposal of leasable minerals (including, among others, coal, oil, and gas) from federal lands that were acquired by the U.S., i.e., lands that were nonfederally owned prior to U.S. obtaining title.

Mineral Leasing Act of 1920
(30 USC 181 et seq., as amended)

These laws provide authority for disposal of leasable minerals on "public domain" federal lands. Both this act and the Mineral Leasing Act for Acquired Lands prohibit leasing of federally owned minerals in units of the National Park System except where specifically authorized by law. The enabling legislation for Glen Canyon, Lake Mead, and Whiskeytown NRAs provides authority for the Secretary of the Interior to lease minerals in these units.

Mineral Materials Disposal Act of 1947
(30 USC 601 et seq.)

Prohibits the sale of "salable" or "common variety" minerals in units of the National Park System. Examples include petrified wood, sand, stone, gravel, pumice, pumicite, cinders, limestone, and clay. However, the Secretary may sell for limited purposes sand, gravel, and rock to the residents of the Stehekin community in the Lake Chelan NRA (30 USC 90c-1b).

Mining in the National Parks Act of 1976
(PL 94-429, 90 Stat 1342, 16 USC 1901 et seq.)

This act closes all units of the National Park System to the location of new mining claims. The act directs the Secretary to determine the validity of unpatented mining claims and to make recommendations regarding claim acquisition, and reinforces the Secretary's authority to acquire and regulate patented and unpatented mining claims in park units.

Mining Law of 1872
(30 USC 21 et seq.)

This law allows citizens to enter open public lands and stake a claim to lands which contain a valuable mineral. Minerals subject to claim location are referred to as "locatable" or "hardrock" minerals and include gold, silver, copper, lead, zinc, cinnabar, tin, talc, salt, feldspar, antimony, bismuth, molybdenum, uranium, and various gemstones. Such minerals are made available to parties for development through the issuance of unpatented and patented mining claims.

Museum Properties Management Act of 1955
(PL Chapter 259, 69 Stat 242, 16 USC 18f)

Authorizes the Secretary of the Interior through the National Park Service to preserve and maintain objects of national historical and archeological significance and to establish and maintain museums in connection with this activity.

National Environmental Policy Act of 1969 (NEPA)
(PL 91-190, 42 USC 4321 et seq., 83 Stat. 852, 42 USC 4332, as amended)

NEPA is the basic national charter for environmental protection. It contains an "action-forcing" provision to ensure that federal agencies act according to the letter and spirit of the law. Among its provisions, this act declares that is the policy of the federal government to "preserve important historic, cultural, and natural aspects of our national heritage." It directs that all practicable means should be used to improve federal functions so that the nation may"...attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences..." Title I of NEPA requires that federal agencies plan and carry out their activities..." so as to protect and enhance the quality of the environment. Such activities shall include those directed to controlling pollution and enhancing the environment." To enact this policy, NEPA requires an interdisciplinary study of the impacts associated with federal programs.

National Flood Insurance Act of 1968
(PL 90-448 Title XIII, 82 Stat 572, 42 USC 4001 et seq., as amended)

This act established a national flood insurance program, encouraged state and local governments to institute planning and land use programs to help reduce damage in flood risk areas, and assured that federal actions, including licensing and permitting, would be coordinated with these efforts.

National Historic Preservation Act of 1966
(PL 89-665, 80 Stat 915-919, 16 USC 470 et seq.)

This established a federal historic preservation program. It authorized the Secretary of the Interior to (1) expand and maintain a national register of districts, sites, buildings, structures, and objects significant in American history; (2) establish a program of matching grants-in-aid to states for

historical preservation; and (3) establish a program of matching grants-in-aid to the National Trust for Historic Preservation. The act also established the Advisory Council on Historic Preservation. The Director of the National Park Service or his or her designee is to be the Executive Director of the Council. A 1980 amendment to this act places specific responsibilities on federal agencies in terms of historic preservation and the conducting of their own programs, planning, and projects (Section 110).

National Park Service Organic Act of 1916
(PL Chapter 408, 39 Stat. 535 et seq., 16 USC 1)

Through this act, Congress established the National Park Service and mandated that it "shall promote and regulate the use of the federal areas known as national parks, monuments, and reservations...by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." The Organic Act authorizes the Secretary to promulgate rules and regulations necessary for management of the parks. This authority, among others, provides the basis for the regulations in 36 CFR 1.

National Trails System Act of 1968
(PL 90-543, 88 Stat 1603, 16 USC 1241 et seq, as amended)

This act established a national system of scenic and recreational trails. Components of the national trails system include national scenic trails, national recreation trails, and connecting or side trails which provide access or link to the former two categories. A 1978 amendment added a category of national historic trails.

National Wildlife Refuge System Administration Act
(PL 93-509, 88 Stat 1603, 16 USC 668 dd-ee)

The purpose of this act was to formally establish the National Wildlife Refuge System and to preserve fish and wildlife species and their habitat, particularly those species threatened with extinction. This act was a precursor to the Endangered Species Act.

Occupational Safety and Health Act of 1970
(PL 91-596, 84 Stat 1590, 5 USC 5108)

This act established national safety and health standards for worker environments, including standards for occupational exposure limits to toxic and/or hazardous agents. The act created the Occupational Safety and Health Administration (OSHA). OSHA is responsible for training requirements for employees working with hazardous material spills and for hazard communication rulings, which set requirements for (1) the development of material safety data sheets (MSDS) by manufacturers and importers, (2) the acquisition of MSDS by product users, and (3) training of employees who work with hazardous materials.

Outer Continental Shelf Lands Act
(PL Chapter 345, 67 Stat 462, 43 USC 1331 et. seq. and 1801 et seq.)

This act sets forth policies and procedures for managing the oil and natural gas resources of the Outer Continental Shelf (OCS), including the issuing of mineral leases. Prior to development, the lessee is required to submit a development and production plan to the Secretary of the Interior for approval. A license or permit may not be granted without concurrence by the affected state that the plan is consistent with its approved coastal zone management program. Amendments in 1987 created the Offshore Oil Pollution Compensation Fund to pay for removal of oil spilled or discharged as a result of activities on the OCS. Under these provisions, public entities, such as the NPS, can file claims against the fund to recover cleanup costs.

Preservation of Historical and Archeological Data Act of 1974
(PL 93-291, 74 Stat 220, 16 USC 469)

This act amended the Reservoir Salvage Act of 1960, and provides for preservation of significant scientific, prehistoric, historic, or archeological data (including relics and specimens) that might be lost or destroyed as a result of (1) the construction of dams, reservoirs, and attendant facilities, or (2) any alteration of the terrain caused as a result of any federal construction project or federally licensed project, activity, or program.

Redwood National Park Act
(PL 95-250, 92 Stat 163, as amended, 1978)

This act amended NPS authorities legislation to direct that within the National Park System, "authorization of activities shall be construed and the protection, management, administration...shall be conducted in light of the high public value and integrity of the National Park System and shall not be exercised in derogation of the values and purposes for which these various areas have been established..." With this additional amendment to NPS law, the NPS is mandated to afford the highest standard of protection and care to park resources; no decision can compromise these resource values, except where specifically authorized by law.

Reservoir Salvage Act of 1960
(16 USC 469-469c, 74 Stat 220, PL 86-523)

This act provides for the recovery and preservation of "historical and archeological data (including relics and specimens)" that might be lost or destroyed as a result of the construction of dams, reservoirs, and attendant facilities and activities.

Resource Conservation and Recovery Act (RCRA)
(PL Chapter 425, 30 Stat 1148, 42 USC 6901)

This act governs the generation, transportation, treatment, storage, and disposal of current and future actively produced hazardous waste, solid waste, and underground storage tanks. Federal

agencies are subject to federal, state, and local requirements. The act authorizes a comprehensive program that regulates hazardous waste from generation to ultimate disposal (cradle to grave). Subtitle D of RCRA (Solid Waste) is regulated through state programs. Regulations for hazardous waste management are in the Federal Register starting at 40 CFR 260. They are immediately preceded by certain solid waste regulations.

Rivers and Harbors Appropriation Act of 1988
(33 USC 401-403, as amended, 1982)

This act established the Army Corps of Engineers' regulatory authority over U.S. navigable waters. The act established permit requirements for construction of bridges, causeways, dams, or dikes within or over navigable waters of the U.S. Bridges and causeway construction is regulated by the Transportation Secretary, while dam and dike permits are reviewed by the Corps of Engineers. Section 10 of the act requires a Corps permit for construction of any "obstruction of navigable waters" of the U.S., and for any excavation, fill, or other modification to various types of navigable waters. Section 13 requires a Corps permit for discharge of refuse of any kind (except liquid from sewers or urban runoff) from land or vessel, into the navigable waters of the U.S. or into their tributaries. Similarly, discharge of refuse is prohibited upon the banks of navigable waters or their tributaries where the refuse could be washed into the water.

Safe Drinking Water Act
(PL 93-523, 88 Stat 1660, 42 USC 300f et seq.)

This act directs EPA to publish and enforce regulations on maximum allowable contaminant levels in drinking water. The act requires EPA to issue regulations establishing national primary drinking water standards; primary enforcement responsibilities lie with the states. The act also protects underground sources of drinking water; primary enforcement responsibilities again lie with the states. Federal agencies having jurisdiction over public water systems must comply with all requirements to the same extent as any nongovernmental entity.

Salmon and Steelhead Conservation and Enhancement Act of 1980
(PL 96-561 Title I, 94 Stat 3275, 16 USC 3301 et seq.)

The purpose of this act is to provide for the enhancement and conservation of the salmon and steelhead resources of the United States. The act provides for the development and implementation of salmon and steelhead management and enhancement plans and provides for a specific program to reduce fishing pressure in the state of Washington.

Surface Mining Control and Reclamation Act of 1977
(PL 95-87, 91 Stat 445, 30 USC 1201 et seq.)

The purpose of this act is to establish a nationwide program to protect the environment from adverse effects of surface coal mining operations, to establish minimum national standards for regulating surface coal mining, to assist states in developing and implementing regulatory programs,

and to promote reclamation of previously mined areas left without adequate reclamation. Under the act, the Secretary of the Interior is directed to regulate the conduct of surface coal mining throughout the U.S., for both federally and nonfederally owned rights. The act established the Abandoned Mine Reclamation Fund which, among other purposes, is to be used for reclamation of land and water affected by coal mining. Lands and water eligible for reclamation under this program are those which prior to the enactment of this act have been mined for coal, or affected by coal mining, and which have been inadequately reclaimed. Public and private lands are eligible for funding.

Surface Resources Use Act of 1955
(30 USC 601 et seq.)

This act prohibits persons from using the surface of unpatented claims for anything but mining. This act provides that claimants of patented mining claims may use the surface of the claim only for purposes related to mineral activity. Claimants may occupy and use resources on the claim only for prospecting and mining. Claimants also may not sell the surface resources (timber, sand, gravel, etc.) from an unpatented claim.

Toxic Substances Control Act
(PL 94-469, 90 Stat 2003, 15 USC 2601 et seq.)

This act regulates existing and new chemical substances and primarily applies to manufacturers, distributors, processors, and importers of chemicals. There are requirements for stock inventory, pre-manufacture notification, testing reporting, and record keeping. Polychlorinated biphenyls (PCBs) are regulated under this legislation. PCBs whose concentration is greater than 50ppm are regulated. Equipment containing regulated PCB must be properly labeled, inspected, and surveyed.

Water Resources Planning Act and Water Resource Council's Principles and Standards Act of 1965
(PL 89-80, 42 USC 1962 et seq., 44 FR 723977, Principles and Standards)

This act states a national policy "to encourage the conservation, development, and utilization of water and related land resources on a comprehensive and coordinated basis by the federal government, states, localities, and private enterprises..." Water Resources Council (WRC) principles and standards for planning water and related land resource uses are revised to achieve national economic development and environmental quality objectives.

Watershed Protection and Flood Prevention Act
(PL 92-419, 16 USC 1001, 68 Stat. 666, as amended, 86 Stat. 667)

This act authorizes the Secretary of the Interior to cooperate with state and local governments, including soil and water conservation districts and flood control districts, in planning and analyzing trends in flood protection and watershed conservation activities and facilities. The Secretary is to

be consulted about such proposed "works of improvement," with regard to activities or facilities that may affect DOI lands.

Wild and Scenic Rivers Act of 1968
(PL 90-542, 82 Stat 906, 16 USC 1271, as amended, 16 USC 1271-1287)

This act established the National Wild and Scenic Rivers System and outlined criteria and procedures whereby free-flowing streams, or portions thereof, could be added to the System. The System includes wild, scenic, and recreational rivers. Where designated rivers are administered by the NPS and there is a conflict between this act and NPS legislation, the more restrictive provisions apply. The act also prohibits the Federal Energy Regulatory Commission from licensing water resources projects on affected rivers and prohibits any federal financial assistance for water resource projects that would have a direct and adverse effect on the values for which the river was designated. The act also directs the appropriate federal parties to cooperate with state pollution control agencies to eliminate or diminish pollution in designated rivers.

Wilderness Act
(PL 88-577, 78 Stat 890, 16 USC 1131 et seq.)

This act established the National Wilderness Preservation System, composed of Congressionally designated federally owned areas. Federal agencies are required to administer these areas to provide for their use and enjoyment, now and in the future, and to protect and preserve their wilderness character.

Yellowstone Park Act of 1872
(PL Chapter 24, 17 Stat 32, 16 USC 21-22)

This established Yellowstone as a national public park, the first of its kind, in which the Congress laid down a new public land policy; namely, that portions of the public lands were to be "reserved and withdrawn from settlement, occupancy or sale...and dedicated and set apart as a public park or pleasuring ground for the enjoyment of the people....That..the Secretary of the Interior...shall provide for the preservation, from injury or spoliation of all timber, mineral deposits, natural curiosities or wonders within said park, and their retention in their natural condition."

EXECUTIVE ORDERS AND DIRECTIVES

Exotic Organism
(E.O. 11987)

This executive order requires federal agencies to "restrict the introduction of exotic species into the natural ecosystems on lands and waters which they own, lease, or hold for purposes of administration..." and "into any natural ecosystem of the United States," and to "encourage the States, local governments, and private citizens to prevent the introduction of exotic into natural

ecosystems of the United States" unless the Secretaries of Agriculture or Interior "find that such introduction or exportation will not have an adverse effect on natural ecosystems."

Federal Compliance with Pollution Control Standards
(E.O. 12088)

This order established procedures and responsibilities to ensure that all necessary actions are taken to prevent, control, and abate environmental pollution with respect to federal facilities and activities.

Floodplain Management of 1977
(E.O. 11988, 42 FR 26951, 3 CFR 121 (Supp 177))

The objective of this order is to avoid, to the extent possible, long- and short-term adverse impacts associated with the occupancy and modifications of floodplains, and to avoid direct and indirect support of floodplain development whenever there is a practicable alternative.

Protection and Enhancement of Environmental Quality
(E.O. 11514, as amended, 1970, E.O. 11991, 35 FR 4247; 1977, 42 FR 26967)

This order declares that "the Federal Government shall provide leadership in protecting and enhancing the quality of the Nation's environment to sustain and enrich human life. Federal agencies shall initiate measures needed to direct their policies, plans and programs so as to meet environmental goals."

Protection of Wetlands
(E.O. 11990, 1977 42 FR 26961, 3 CFR 121 (Supp 177), 42 USC 4321)

This executive order furthers the purposes of the National Environmental Policy Act by directing federal agencies to "...avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative..." The directive applies both to "Major federal actions significantly affecting the quality of the human environment" and to all other actions.

Training
(E.O. 11348)

Authorizes the Civil Service Commission (CSC) to issue regulations governing training programs for federal government employees. Provides direction to agency heads concerning how the statutory authority in 5 USC 41 (formerly known as the Government Employees Training Act) is to be implemented in order to prioritize, conduct, evaluate, and report on the training of federal government employees.

Training
(E.O. 12107)

Implements Reorganization Plan No. 2 of 1978 by establishing the Office of Personnel Management (OPM) and transferring various functions from the Civil Service Commission (CSC) to the OPM, including performing the training responsibilities as set forth in 5 USC 41 (formerly known as the Government Employees Training Act).

Wild and Scenic Rivers

Presidential Directive to all federal agencies, August 2, 1979.

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*U.S. GOVERNMENT PRINTING OFFICE: 1991--524-709/D06411