

NATIONAL PARK SERVICE RESEARCH ON EXOTIC SPECIES AND THE POLICY  
BEHIND THAT RESEARCH: AN INTRODUCTION TO THE SPECIAL  
SESSION ON EXOTIC SPECIES

John G. Dennis  
Natural Resources Division  
National Park Service  
Washington, D.C. 20240

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INTRODUCTION

An awareness has developed in recent years that exotic species are much more prevalent in areas of the National Park System than once was suspected. It also has become clear that the presence and activities of exotic species in areas dedicated to the preservation of natural ecological systems represent a form of adverse human impact that in some cases may threaten the very survival of the natural systems being protected. This awareness of the potential impact of exotic species has led the National Park Service to fund a diversity of research projects designed to examine impacts and life histories of, and potential control techniques for, a number of plant and animal species that are exotic to one or more parks. The potential for widespread application of the results of this research resulted in the convening of a special session at the Second Conference on Scientific Research in the National Parks to focus attention on exotic species problems and research and through that focusing to encourage co-operation in study, information exchange, and management application for exotic species problems that are common to several parks. The results of this special session, plus an historical review of the Service's policy toward exotic species, are summarized in this introductory paper.

NATIONAL PARK SERVICE POLICY ON EXOTIC SPECIES

The National Park System was created to preserve examples of the natural and historic objects characteristic of the United States. With respect to living things in the National Park System, the term "natural objects" has evolved to mean individual plants and animals, species of plants and animals, habitats of plants and animals, and ecological systems containing these plants, animals, and habitats which represent either conditions present prior to the time at which there was a major change in the origin and rate of impact of human influence, or conditions that would have existed today had modern people not interfered with the normal processes of ecological and evolutionary change. Similarly, the term "historic objects" has evolved to mean individual objects, sets of objects, buildings, other structures, groups of structures, scenes, works of art, inventions, life styles, and any other items or works associated with human activities that provide insight or understanding into the human past (Everhardt, 1977).

In managing these natural and historic objects, the National Park Service early in its history recognized that some species in park areas were "exotic" - "introduced from another country: not native to the place where found," rather than "native" - "living or growing naturally in a particular region" (Webster's New Collegiate Dictionary). As the Service gained experience with management of parks and of the living objects found there, it refined its definition of exotic species to be species that occur in a given place, area, or region as the result of direct or indirect, deliberate or accidental introduction of the species by humans; and native species to be species which presently occur, or once did occur prior to some human influence, in a given place, area, or region as the result of ecological processes that operate and have operated without significant direct or indirect, deliberate or accidental alteration by humans.

The basis for this development of terminology about exotic species has been the Service's continuing recognition that exotic species threaten preservation of park natural resources. For example, Wright, Dixon, and Thompson (1932, p. 46) wrote:

This (encroachment of exotic species upon the native park fauna) is a situation which is not apparent in many parks at present, but which is apt to become more and more difficult. There are three ways in which man has brought about the introduction of exotics.

- (a) many important species of animals, notably game birds and fishes, are liberated all over the country each year in the interests of sportsmen.
- (b) Exotic species are constantly being liberated by accident.
- (c) Certain animals native to one part of the country actually flourish with civilization and invade new ranges in the wake of man. These are exotic in their newly occupied ranges, too.

If any animal introduced by any of the above means takes hold and spreads into a park, serious complications are bound to ensue, for such an animal would not increase if it were not able to displace another form or compete successfully in the utilization of a valuable food supply. Aside from the direct competitive effect, such introductions may have indirect influences, such as disease introduction and production of crossbreeds . . .

As another example from that period, Director Horace Albright (1933, pp. 490, 493) stated:

. . . it is important to emphasize that the policy of the National Park Service is unalterably against the introduction of exotic species of animals or plants in the national parks or national monuments, except for the occasional stocking of an otherwise barren body of water with some species of game fish . . .

Several decades later, a discussion paper containing a forward by Director Conrad L. Wirth (USDI, National Park Service, 1957) cited policies for the maintenance of natural conditions that included controlling all exotic pests of vegetation, eradicating exotic plants, and eliminating or controlling exotic animals.

Two reports in the next decade, the Leopold report on wildlife management (Leopold, et al., 1963) and the Robbins report on research (Robbins, et al., 1963) referred to exotic species in ways that indicated the presence of exotic species is inappropriate for areas set aside to preserve natural conditions. In a specific response to the Leopold report, the Secretary of the Interior instructed the Director of the National Park Service to ". . . take such steps as appropriate to incorporate the philosophy and the basic findings into the administration of the National Park System" (Udall, 1963). With respect to exotic species, the Service responded to this instruction informally in such statements as one by Sumner (1964) that "Non-native species are to be eradicated, or held to a minimum if complete eradication is impossible," and formally with the 1970 publication of the Administrative Policies for Natural Areas of the National Park System which stated that, "Non-native species may not be introduced into natural areas. Where they have become established or threaten invasion of a natural area, an appropriate management plan should be developed to control them, where feasible . . .," and that "Non-native species of plants and animals will be eliminated where it is possible to do so by approved methods which will preserve wilderness qualities" (USDI, National Park Service, 1970, pp. 17, 56, respectively).

The recognition that exotic species are inimical to the successful management of areas set aside for preservation of natural values has been reiterated many times in the decade of the seventies. For example, the Conservation Foundation (1972, p. 12) recommended, in its centennial study of the future of the National Park System, that ". . . the stocking of exotic species should stop. . . ." Again, Lamprey (1972, p.7), in a background paper for the Second World Conference on National Parks, stated:

If the policy of a national park is to conserve natural communities, the introduction of exotic plant and animal species will be avoided as a matter of principle. . . . While there may be aesthetic objections to an introduction, there will also be the more cogent objection on ecological ground that the exotic species may suppress one or more indigenous ones.

Similarly, the National Park Service, in revising the statement of its policy regarding exotic species in its 1975 Management Policies (USDI, National Park Service, 1975) prohibited the introduction of new exotic species into natural zones of parks; permitted the controlled introduction of such species into historic, development, and special use zones of parks; and stated that control or eradication of existing populations of exotic species would occur in a variety of situations where park purposes or adjacent land owners were being threatened by such species. Director Everhardt reemphasized this policy two years later (Everhardt, 1977), and the Service restated the policy in yet more

detail in the 1978 publication of its Management Policies (USDI, National Park Service, 1978). This most recent restatement of the Service's exotic species policy (reproduced in Appendix A) reflected both additional experience with exotic species management and promulgation of the President's Exotic Organisms Executive Order No. 11987 (Carter, 1977), a copy of which is provided in Appendix B.

From this review of the development of the National Park Service's exotic species policy, it is clear the Service long has recognized that exotic species constitute a human-caused threat to the preservation of park resources. Existing information about the roles of exotic species in the ecology of park areas demonstrates that this threat is among the most insidious of all human-caused threats to park preservation, both because of the self-reproducing nature of plants and animals and because these plants and animals, the immediate agents of the threats, reside within the very parks they threaten. Existing information also makes it clear that the magnitude of this threat varies from park to park, since populations of exotic species range from only a few individuals in small areas of some parks, to thousands of individuals distributed throughout the total areas of other parks. In response to these conclusions, the Service's existing policy regarding exotic species has been constructed to deal effectively with the serious threats to park resources that can be caused by such species while providing the flexibility necessary to accommodate the large diversity of purposes and existing conditions characteristic of the various units of the National Park System.

#### NATIONAL PARK SERVICE RESEARCH ON EXOTIC SPECIES

Populations of exotic species in units of the National Park System include species of vertebrate animals, invertebrate animals, vascular plants, and non-vascular plants. The populations of exotic vertebrate species include universally recognized pests, such as the black rat; native North American species, such as the rainbow trout and Kokanee salmon, which have been moved to areas outside their native ranges; non-game and game species, such as the starling, house sparrow, ring-necked pheasant, and European boar, which were deliberately brought to North America to be added to the continent's fauna; and draft animals, such as the horse and burro, which were brought to North America as domestic stock and later were abandoned to the wild. Examples of exotic invertebrate species include the European elm bark beetle and the balsam woolly aphid, which attack such native tree species as the American elm and fraser fir, respectively; and the fire ant, which creates potential health hazards. Examples of exotic vascular plant species include Bermuda grass, tumbleweed, honeysuckle, kudzu, Australian pine, tamarisk, mimosa, eucalyptus, and Brazilian holly. Examples of exotic non-vascular plant species include the Dutch elm disease and the chestnut blight. Based on two exploratory surveys of exotic vertebrate species found in units of the National Park System (National Parks and Conservation Association, 1977; National Park Service, unpublished),

the exotic vertebrate species mentioned above represent a small portion of the total Servicewide exotic vertebrate fauna, which consists of approximately 64 fish, 3 amphibian, 14 reptile, 31 bird, and 32 mammal species or subspecies. The presence of one or more such species found in 153 or more park areas that were set aside at least in part for preservation of natural conditions exemplifies the kinds of circumstances that led Courtenay (1978, p. 237) to write, "The introduction of exotic organisms for non-agricultural purposes . . . is a game of ecological roulette where the gains have been few and the mistakes many. And, as in any game of roulette, there have been great losses."

Current National Park Service research, as represented by papers presented in this Special Session on Exotic Species, focuses on mitigating the many losses that have been incurred by past games of ecological roulette. Of 20 papers published in this section plus one paper published in the Fisheries Resources section of Volume 2 and three papers published in the Mammal Studies section of Volume 12 of these proceedings, half address the assessment of impacts of an exotic species and half examine possible control techniques, including biological control. Fourteen of the 24 papers deal with one or more of seven ungulate species, seven deal with vascular plants, and one each deals with rodent, fish or invertebrate species. This sampling of ongoing research includes projects from 12 parks from six National Park Service regions plus two laboratory projects having immediate multi-park applicability.

An additional five papers were presented only orally. One of the five dealt with impacts, the other four dealt with possible control techniques. Three of the five concerned ungulates, one a lagomorph, and one a fish. Three reported park projects, of which one was in a different park than the 12 mentioned earlier, and two reported information of a multi-park nature.

The final segment of the Special Session on Exotic Species was an open discussion period which focused on the procedural and policy concerns and questions which underlie the research reported in the paper portions of the Special Session. The discussants identified need for additional expositions of the relationship of policy to law, of the inherent value of a natural system and the manner in which exotic species impact the naturalness of such a system, and of the value of a policy that permits flexibility of response compared with one that requires absolute response. In addition, the discussion group suggested that refining terminology about exotic species would be valuable and that there would be benefit in identifying a cost-effective way for determining how much of what kinds of research are needed to discover whether or not a problem exists, and if so, what management actions are available for its solution. The group also concluded that there often may be a need to apply restorative measures once an exotic species has been removed and that a monitoring program would be beneficial in determining the effectiveness of removal of exotic species and restoration of their impacts. Finally, the group emphasized that there is value in drawing on a diversity of tools to ensure effective dissemination of information about exotic species, the impacts of those species in areas dedicated to preservation of natural systems, and the choices available for mitigating the impacts.



## CONCLUSIONS

The results of the Special Session on Exotic Species suggests that there is widespread awareness in the National Park Service of the detrimental impact that exotic species can have on the protection and preservation of natural systems. The fairly even balance between impact assessment papers and control technique papers suggests that the Service recognizes the importance of both types of research. The apparent lack of balance among subject organisms suggests either that the majority of the Service's problems center on the vegetation and soils impacts associated with exotic ungulates, or, perhaps more likely, that the often extreme visibility of these impacts has focused an inordinate amount of attention onto ungulate problems. In addition, the emphasis given to exotic species problems by the convening of a Special Session should enhance communication and coordination of research and resource management effort among parks with common exotic species problems. Finally, the greater visibility also should increase awareness among park resource managers of the need to know about roles of exotic species in natural areas, to learn enough about those species and their roles to know how to manage the species, and to make the resulting knowledge available to all interested persons.

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EXOTIC PLANTS AND ANIMALS

Definitions - Exotic species are species that occur in a given place, area, or region as the result of direct or indirect, deliberate or accidental introduction of the species by humans. For example, species that humans deliberately have introduced into, and established in, the

wild in North America for use as free-roaming game animals on private and non-park public lands clearly are exotic species on National Park System lands that have been set aside for preservation of examples of the natural or historic features characteristic of the United States. Such exotic species are not natural components of the ecological systems characteristic of the given location, and as a result, have not evolved in concert with the evolution of those species that are native to the location. The native species are species which presently occur, or once did occur prior to some human influence, in a given place, area, or region as the result of ecological processes that operate and have operated without significant direct or indirect, deliberate or accidental alteration by humans. For the purposes of this section, direct or indirect, deliberate or accidental introductions by humans are ones that have permitted species to cross natural barriers to their dispersal capabilities thus giving those species opportunities to become established in areas previously inaccessible to them because of natural forces. For example, the stocking of a fish-free portion of a river above a waterfall with fish taken from a portion of the same river below the waterfall is a human act that permits a species to cross a natural barrier to dispersal and thus is an act of deliberate introduction of an exotic species.

Introduction of New Exotic Species - Decisions on whether to introduce to a park species that are not native to the park will be controlled by the purposes and designated zones of the park. In natural zones, non-native plant and animal species may not be introduced except in rare cases where they are the nearest living relatives of extirpated native species or where they may be used to control established exotic species. In historic zones, non-native plant and animal species may be introduced in rare cases similar to those identified for natural zones. In addition, non-native species that are a desirable part of the domestic historic scene being represented in an historic zone may be introduced, but only if they are controlled and maintained by recognized domestic techniques, such as cultivation, tethering, herding, or pasturing. In park development and special use zones, non-native species of plants and animals may be introduced to carry out programs consistent with park objectives only when it can be shown: 1) that the most appropriate native species are extinct, 2) that other native species will not meet the needs of the management program, 3) that, based on scientific advice from appropriate Federal, State, local, and non-governmental sources, each species proposed for introduction will not become a pest, and 4) that such introductions will not spread and disrupt desirable adjacent natural plant and animal communities and associations, particularly those of natural zones.

Reference: Executive Order 11987, Exotic Organisms, May 24, 1977

Control of Exotic Species Already Present in a Park - Manipulation of population numbers of exotic plant and animal species, up to and including total eradication, will be undertaken whenever such species threaten protection or interpretation of resources being preserved in the park. Examples of threatening situations include: 1) being detrimental to public health, 2) disrupting the faithful presentation of the historic scene, 3) damaging historic and archeological resources, 4) threatening the perpetuation of natural features, native species (including especially those that are endangered, threatened, or otherwise unique), natural ecological communities, or natural ecological processes, and 5) significantly hampering the management of adjacent park or non-park lands. Control programs will most likely be taken against exotic species which have a high impact on protected park resources and where the program has a reasonable chance for successful control; programs are least likely to be initiated against exotic species which have almost no impact on park resources and where there is a minimal probability for successful control. The decision to initiate a control program will be based on existing and newly acquired, scientifically valid resource information that identifies the exotic status of the species, demonstrates its impact on park resources, and indicates alternative control methods and their probabilities of success. Development of a control plan and implementation of actions to protect the park resources will be done according to established planning procedures and will include provisions for public review and comment. Care will be taken that programs to control exotic species do not result in significant damage to native species, natural ecological communities, natural ecological processes, or historic objects.

## Exotic Organisms

*Executive Order 11987. May 24, 1977*

By virtue of the authority vested in me by the Constitution and statutes of the United States of America, and as President of the United States of America, in furtherance of the purposes and policies of the Lacey Act (18 U.S.C. 42) and the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 *et seq.*), it is hereby ordered as follows:

SECTION 1. As used in this Order:

(a) "United States" means all of the several States, the District of Columbia, the Commonwealth of Puerto Rico, American Samoa, the Virgin Islands, Guam, and the Trust Territory of the Pacific Islands.

(b) "Introduction" means the release, escape, or establishment of an exotic species into a natural ecosystem.

(c) "Exotic species" means all species of plants and animals not naturally occurring, either presently or historically, in any ecosystem of the United States.

(d) "Native species" means all species of plants and animals naturally occurring, either presently or historically, in any ecosystem of the United States.

SEC. 2. (a) Executive agencies shall, to the extent permitted by law, 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, shall encourage the States, local governments, and private citizens to prevent the introduction of exotic species into natural ecosystems of the United States.

(b) Executive agencies, to the extent they have been authorized by statute to restrict the importation of exotic species, shall restrict the introduction of exotic species into any natural ecosystem of the United States.

(c) Executive agencies shall, to the extent permitted by law, restrict the use of Federal funds, programs, or authorities used to export native species for the purpose of introducing such species into ecosystems outside the United States where they do not naturally occur.

(d) This Order does not apply to the introduction of any exotic species, or the export of any native species, if the Secretary of Agriculture or the Secretary of the Interior finds that such introduction or exportation will not have an adverse effect on natural ecosystems.

SEC. 3. The Secretary of the Interior, in consultation with the Secretary of Agriculture and the heads of other appropriate agencies, shall develop and implement, by rule or regulation, a system to standardize and simplify the requirements, procedures and other activities appropriate for implementing the provisions of this Order. The Secretary of the Interior shall ensure that such rules or regulations are in accord with the performance by other agencies of those functions vested by law, including this Order, in such agencies.

JIMMY CARTER

The White House,  
May 24, 1977.