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NATIONAL PARK SERVICE MANAGEMENT POLICY GUIDANCE FOR RESTORATION OF AMERICAN CHESTNUT TO NATIONAL PARK SYSTEM UNITS

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Abstract: The National Park Service's Management Policies 2001 provide clear guidance for decisions regarding management of the nearly extirpated American chestnut (*Castanea dentata*). Restoration is appropriate and may involve active planting, cross breeding, and genetic engineering using genotypes from areas within and outside the parks. Restoration must be based on science, analyzed through environmental compliance processes, include the public, and consider actively involving partners.

Keywords: management policies / restoration / American chestnut / blight / exotic species

INTRODUCTION

Law, policy, philosophy, and science contribute to decision-making about whether or not to attempt to restore the American chestnut (*Castanea dentata*) to one or more units of the National Park System. The following discussion addresses these components of decision-making by examining specific provisions and then identifying possible pathways for applying them to management actions.

EXCERPTS FROM NATIONAL PARK SERVICE MANAGEMENT POLICIES 2001

The National Park Service develops and publishes the Management Policies to interpret the many laws that authorize and direct the purposes, uses, and management of lands incorporated into the National Park System and to fill in details not specifically addressed in the laws. The Service's Management Policies 2001 provide both general and specific guidance regarding management of park natural resources. The statements provided in this section are taken directly from, or paraphrase, selected entries in the Management Policies 2001.

Natural Conditions

In its most general terms, the Management Policies 2001 directs the Service to preserve the natural resources, processes, systems, and values of units of the national park system in an unimpaired, evolving condition. More specifically, they direct the Service to:

- preserve the natural resources, processes, systems, and values of units of the national park system in an unimpaired condition, to perpetuate their inherent integrity and to provide present and future generations with the opportunity to enjoy them;
- recognize that natural processes and species are evolving and allow this evolution to continue, minimally influenced by human actions; and
- apply the term "natural condition" to mean the condition of resources that would occur in the absence of human dominance over the landscape.

Natural Ecosystems and Native Species

The Service becomes more specific in its policy guidance for natural ecosystems and native species through four major concepts. The first concept provides a broad ecosystem overview: the Service generally does not intervene in natural biological or physical processes – when it does, such as to remove human-impacts to natural ecosystem functioning, it bases its actions on clearly articulated, well-supported management objectives and the best scientific information available. The following specific statements guide the implementation of this ecosystem approach:

- the Service will not intervene in natural biological or physical processes, with certain exceptions;
- actions to restore natural ecosystem functioning that has been disrupted by past or ongoing human activities will use the minimum necessary interventions to achieve the stated management objectives;
- biological or physical processes altered in the past by human activities may need to be actively managed to restore them to a natural condition or to maintain the closest approximation of the natural condition in situations in which a truly natural system is no longer attainable;
- landscape and vegetation conditions altered by human activity may be manipulated where the park management plan provides for restoring the lands to a natural condition;
- revegetation efforts usually will use propagules representing species and gene pools native to the ecological portion of the park in which the restoration project is occurring but may use improved varieties or closely related native species for a natural area so degraded that restoration with gene pools native to the park has proven unsuccessful;
- because naturally ignited fire is a natural process in many ecosystems sustained in parks, each park with vegetation capable of burning will prepare a fire management plan addressing natural and cultural resource objectives; safety considerations for park visitors, employees, neighbors, and developed facilities; and potential impacts to public and private property adjacent to the park; and
- the extent and degree of management actions taken to protect or restore park ecosystems or their components will be based on clearly articulated, well-supported management objectives and the best scientific information available.

The second major concept addresses species population dynamics: the Service generally does not intervene in native plant and animal species dynamics and natural fluctuations in their populations. Components of this concept include:

- native species are species that have occurred or now occur as a result of natural processes on lands designated as units of the national park system and so native species in a place are evolving in concert with each other;
- natural processes are relied upon to maintain native plant and animal species and to influence natural fluctuations in populations of these species;
- the Service maintains as parts of park natural ecosystems all native plants and animals by:
 - preserving and restoring natural abundances, diversities, dynamics, distributions, habitats, and behaviors of native plant and animal populations and the communities and ecosystems in which they occur;
 - restoring native plant and animal populations in parks when they have been extirpated by past human-caused actions; and
 - minimizing human impacts on native plants, animals, populations, communities, and ecosystems, and the processes that sustain them.

The third major concept addresses protection of the full genotypic range of native plant and animal populations in the parks. Features of this concept include:

- individual plants and animals found within parks are genetically parts of species populations that may extend across both park and non-park lands; providing for the persistence of a species in a park may require maintaining a number of local populations, often both within and outside the park;
- protecting the full range of genetic types (genotypes) of native plant and animal populations in the parks is achieved by perpetuating natural evolutionary processes and minimizing human interference with evolving genetic diversity;
- steps for protecting species native to national park system units that are listed under the Endangered Species Act include:
 - active management programs to inventory, monitor, restore, and maintain habitats of listed species, control detrimental non-native species, control detrimental visitor access, and re-establish extirpated populations as necessary to maintain the species and the habitats upon which they depend;
 - cooperation with other agencies, states, and private entities to promote candidate conservation agreements aimed at precluding the need to list species; and
 - developing management actions for the protection and perpetuation of federally, state, or locally listed species through the park management planning process, including consultation with lead federal and state agencies as appropriate;
- intervention to manage individuals or populations of native species only when:
 - such intervention will not cause unacceptable impacts to the populations of the species or to other components and processes of the ecosystems that support them;
 - management is necessary to protect rare, threatened, or endangered species; or
 - removal of individuals or parts thereof is part of an approved research project; is done to provide propagules for restoring native populations in parks or cooperating areas without diminishing the viability of the park populations from which the individuals are taken; or meets specific park management objectives;
- restoration of extirpated native plant and animal species to parks whenever all of the following criteria are met:
 - adequate habitat to support the species exists or can be restored in the park, and if necessary also on adjacent public lands and waters, and, once a natural population level is achieved, the population can be self-perpetuating;
 - the species does not, based on an effective management plan, pose a serious threat to the safety of people in parks, park resources, or persons or property outside park boundaries;
 - the genetic type used in restoration most nearly approximates the extirpated genetic type; and
 - the species disappeared, or was substantially diminished, as a direct or indirect result of human-induced change to the species population or to the ecosystem;
- the need to maintain appropriate levels of genetic diversity will guide decisions on what actions to take to manage isolated populations of species or to enhance population recovery; and
- actions to transplant organisms for purposes of restoring genetic variability through gene flow between native breeding populations will be preceded by an assessment of the genetic compatibility of the populations.

The fourth major concept addresses methods for obtaining propagules for restoring plant species to parks:

- programs to restore plant species may include propagating plants in greenhouses, gardens, or other confined areas to develop propagules for restoration efforts or to manage a population's gene pool.

Pest Management

The Service provides specific policy guidance regarding pest management. It relies on integrated pest management (IPM - a decision-making process that coordinates knowledge of pest biology, the environment, and available technology to prevent unacceptable levels of pest damage, by cost-effective means, while posing the least possible risk to people, resources, and the environment) to guide managing pests in parks. It monitors use of pesticides (any substance or mixture that is used in any manner to destroy, repel, or control the growth of any viral, microbial, plant, or animal pest) in parks through case-by-case review of pesticide use requests, taking into account environmental effects, cost and staffing, and other relevant considerations. It allows use of a chemical, biological, or bio-engineered pesticide in a management strategy following a determination by a designated IPM specialist that such use is necessary, and that all other available options are either not acceptable or not feasible.

Managing Non-Native Species

The Service identifies as exotic (non-native, alien, or invasive) species those species that occupy or could occupy park lands directly or indirectly as the result of deliberate or accidental human activities. The Service devotes significant management attention to exotic species because these are species that did not evolve in concert with the species native to the place, are not a natural component of the natural ecosystem at that place, and, as a result, threaten the naturalness of the ecosystem being preserved to the degree that they out-compete the native species or alter the natural processes of the ecosystem.

The Service's goal for managing exotic species is to not allow them to displace native species if displacement can be prevented. In general, new exotic species will not be introduced into natural ecosystems in parks while, in rare situations, an exotic species may be introduced or maintained to meet specific, identified management needs when all feasible and prudent measures to minimize the risk of harm have been taken. Such deliberate introductions may occur when the species is:

- a closely related race, subspecies, or hybrid of an extirpated native species; or
- an improved variety of a native species in situations in which the natural variety cannot survive current, human-altered environmental conditions; or
- used to control another, already-established exotic species.

In some situations, exotic plant and animal species are maintained to meet an identified park purpose. In all other situations, exotic plant and animal species that do not meet an identified park purpose will be managed— up to and including eradication— if (1) control is prudent and feasible, and (2) the exotic species:

- interferes with natural processes and the perpetuation of natural features, native species or natural habitats; or
- disrupts the genetic integrity of native species; or
- disrupts the accurate presentation of a cultural landscape; or
- damages cultural resources; or
- significantly hampers the management of park or adjacent lands.

For species requiring management, high priority will be given to managing those exotic species that have, or potentially could have, a substantial impact on park resources, and that can reasonably be expected to be successfully controlled. Lower priority will be given to exotic species that have almost no impact on park resources or that probably cannot be successfully controlled.

The decision to initiate management is based on a determination that the species is exotic. For species determined to be exotic and where management appears to be feasible and effective, parks evaluate the species' current or potential impact on park resources; develop and implement exotic species management plans according to established planning procedures; consult, as appropriate, with federal and state agencies; and invite public review and comment, where appropriate. In designing programs to manage exotic species, parks seek to avoid causing significant damage to native species, natural ecological communities, natural ecological processes, cultural resources, and human health and safety.

Soil Management

Any program to restore plants to natural systems must recognize and provide for soil management to the degree that the natural soil condition has been disrupted by past human activities. As a result, the Service seeks 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. Where necessary, the Service may import off-site soil or soil amendments to restore damaged sites where such use of a soil, fertilizer, or other soil amendment may be appropriate, provided that the use does not unacceptably alter the physical, chemical, or biological characteristics of the soil, biological community, or surface or ground waters. Soil obtained from off-site normally will be salvaged soil, not soil removed from pristine sites, unless the use of pristine site soil can be achieved without causing any overall ecosystem impairment to the donor site.

PHILOSOPHICAL FOUNDATION

The conceptual goal of seeking to manage parks to achieve the natural condition as defined in the Management Policies clearly is impractical to achieve given the already existing degree of human dominance over the entire earth. However, identifying the natural condition as the desired condition is useful. With respect to the question of restoring the chestnut to parks, such identification gives park managers a clearly stated, measurable goal towards which to direct their scientific study and resource management efforts. Park managers address this goal by developing achievable intermediate goals and practical steps for achieving those intermediate goals. The remainder of this paper focuses on practical, policy-appropriate science and management steps that warrant consideration in efforts to develop a chestnut restoration plan and supporting program.

APPLICATION OF NPS MANAGEMENT POLICIES TO RESTORATION OF CHESTNUT TO PARKS

Role of Science

Decisions about natural resource management are based on planning supported by scientific and scholarly information, environmental evaluation, and public involvement. Scientific activities of inventory, monitoring, research, and assessment are important components of a chestnut restoration program because they:

- contribute to developing a long-range strategy;
- guide the functioning of interdisciplinary teams and processes;
- permit articulating the desired future conditions for the park's natural resources;
- provide the tools for obtaining and integrating the best available science;
- generate understanding of the effects of management actions on natural resources whose function and significance are not clearly understood;
- provide the framework for applying long-term research or monitoring in an adaptive management context to evaluate results;
- provide the data for fully and openly evaluating environmental costs and benefits and, through public involvement, incorporating mitigation measures; and
- underlie planning for clearly avoiding impairment of park natural resources and values.

Potential Role of Special Designation Areas

The Management Policies make available to parks two special site designations (Research Natural Areas and Experimental Research Areas) that could be used to facilitate and focus efforts to restore the chestnut to parks. Research Natural Areas are sites within parks that contain prime examples of natural resources and processes, including significant genetic resources, and that have value for long-term observational studies or as control areas for manipulative research taking place outside the parks. Experimental Research Areas are specific tracts in limited situations that are managed for approved manipulative research, which is research involving conscious alteration of existing conditions as part of the experimental design.

Activities in Research Natural Areas generally will be restricted to non-manipulative research, education, and other activities that will not detract from an area's research values. Activities in Experimental Research Areas involve a greater degree of manipulation as part of the research design but also can include other potential uses, such as education or other activities that will not detract from the area's research purpose.

Decisions and Actions Involve Partners

NPS fully recognizes that many organizations are involved in efforts to restore the chestnut to the forests of the United States. Management Policies encourage park managers to develop agreements appropriately with others to coordinate chestnut restoration activities in ways that would maintain and protect, not compromise, park resources and values, including the integrity of native gene pools and natural ranges of species and ecological communities. In entering into such agreements, park managers would be encouraged to work with other land managers to encourage the conservation of populations and habitats of the chestnut wherever and whenever possible, including through such NPS actions as:

- participating in local and regional scientific and planning efforts, identifying chestnut local population characteristics and ranges, and developing cooperative strategies for maintaining or restoring park components of these local populations;
- preventing the introduction of new exotic species into units of the National Park System while removing populations of the chestnut blight that have already become established in parks, and
- providing small quantities of chestnut genetic material from parks for cooperators to use in selective breeding, genetic engineering, or propagule generation efforts.

At the same time, the Policies encourage managers to avoid the dissemination into the wild of chestnut genetic material outside the native range of the chestnut, unless such dissemination is conducted under a

specific, scientifically-based management program designed to mitigate for a human-facilitated environmental impact, such as habitat fragmentation or global climate change.

Decisions and Actions to Restore the Chestnut

Park actions to restore the chestnut would respond to clear goals, implement a proactive strategy, and be based on the clear responsibility park managers have to preserve natural conditions. Goals could include:

- re-establishing in human-disturbed components of park natural systems (those where introduction of the chestnut blight has nearly eliminated a dominant native species) the natural functions and processes provided by the chestnut by restoring appropriate chestnut genotypes or the best available surrogates;
- using the best available technology, within available resources, to restore the chestnut and, as a result, to stimulate restoration of its associated biological and physical system components and accelerate recovery of landscape and biological-community structure and function; and
- removing the exotic species or at least greatly reducing its role in the ecosystem.

Elements of an appropriate strategy would include:

- maintaining existing, in-park, local populations of native genotype plants that continue to resprout following blight-induced death of their previous sprouts for the purpose of maintaining living genetic material for future research efforts
- restoring the native species using organisms taken from populations as closely related genetically and ecologically as possible to park populations, preferably from similar habitats in adjacent or local areas, where possible;
- introducing different native genotypes where the management goal is to increase the variability of the park gene pool to mitigate past, human-induced loss of genetic variability; guided by knowledge of local adaptations, ranges, and habitat requirements, and detailed knowledge of site ecological histories;
- introducing novel, non-native genotypes where the management goal is to develop a gene pool that is genetically resistant to the chestnut blight, guided by a goal of inserting the resistance with as minimal an insertion of other non-native genes as possible;
- applying the Service's integrated pest management (IPM) program to eradicate, or at least control, the chestnut blight to whatever degree possible while reducing risks to the public, park resources, and the environment from chestnut blight and blight management strategies; and
- utilizing appropriate soil conservation and soil amendment practices to facilitate restoring the chestnut in ways that prevent or minimize adverse, potentially irreversible impacts on soils.

Given that the park is the basis and focus of NPS natural resource management programs, it is important to recognize that:

- resource management is a local activity and the park superintendent exercises the responsibility for, and is held accountable for, all actions that occur within the park – therefore, cooperative actions to develop an NPS chestnut restoration activity would use the park and its partners as the basic building block; and
- the Service's use of networks of parks for inventory and monitoring purposes would offer a strategic opportunity for cooperatively applying metapopulation and biological corridor concepts to chestnut restoration efforts.

DISCUSSION

From this review of NPS Management Policies, it becomes clear that NPS policy is not an issue for determining whether or not to restore the chestnut to parks. Our current state of knowledge about the status of the chestnut meets key policy provisions:

- extirpation is occurring and its cause is known to be an exotic species, hence the extirpation is human-caused and management restoration is appropriate;
- the impact of the extirpation on park natural resources is apparent – loss of a dominant species, probability of cascading ecological effects, associated human social and economic effects, all of which possibly may constitute impairment; and
- a management response is clearly possible – minimize the effect of the exotic species both by controlling the exotic species and by developing and planting seeds, seedlings, and saplings of a blight-resistant chestnut genotype.

These policy provisions suggest a clear goal - restore a naturally functioning, natural ecosystem by restoring a nearly extirpated native species, eliminating the exotic species or at least neutralizing its impact on that native species, and restoring the ecosystem function once provided by the native species.

The policy goal of maintaining a practically appropriate level of genetic fidelity can be met. First, although many of the original local population gene pools are so diminished they probably can not be restored, there are a few existing, endemic, apparently disease-resistant North American genotypes that can be propagated and disseminated as a means of maintaining at least some native genetic material in the gene pools used for restoration. Second, specific, appropriate genes from several nearest-relative gene pools can be injected into the residually available North American gene pools either through cross breeding of North American and Asian genotypes or through using genetic engineering to insert selected foreign genes into the residual native genotypes.

If a decision were to be made to implement this policy of restoring a species and its associated ecosystem, there are clear science needs that must be met as part of planning, NEPA analysis, and developing restoration methods. These information needs include:

- understanding how the existing ecosystems and their current floras, faunas, and physical features might change if restoration were successful;
- assessing whether any native species would become at risk if restoration were successful;
- determining if there would be any risk of introducing other pathogens in association with planting cultivated seeds or young trees;
- addressing what side effects, if any, individual park ecosystems or their local chestnut populations would experience as a result of addition of a genetically modified chestnut to the individual ecosystems;
- determining whether any physical alteration of existing ecosystems would be needed to achieve an effective restoration and, if so, what would those alterations be; and
- developing park chestnut restoration activities as scientific experiments with good design, methods, replication, and documentation – in essence, structuring these activities as adaptive management.

Carrying out a chestnut restoration program clearly would have to involve the public. The program would be a long term activity requiring support over many years. It would depend on the involvement and good will of many partners. It would have to be based on a clear understanding by all participants of the scientific basis for, and methodological requirements of, each of the possible management approaches.

Because of its ultimate wide spread distribution over the landscape and through time, its probability of success would depend on the level of stakeholder agreement, support, and participation maintained across space and through time.

The NPS Management Policies provide a framework for determining what kinds of restoration management action might be appropriate, for ensuring that scientific findings play a significant role in informing the determination, and for broadly and effectively involving the public in the decision-making process. For whatever management program might be adopted, the Policies leave to the discretion of the site manager what specific mix of technologies to apply, with the mix at any given site being influenced by such site-specific factors as what the science shows to be technically possible, what the environmental analysis shows to be the trade-offs between environmental and human benefit and detrimental impact, what actions the public involvement reveals to be locally and generally acceptable, and what fiscal and human resources are likely to be available for conducting the management program over the projected duration of the restoration effort.

CONCLUSION

National Park Service management policies encourage restoration of the chestnut to park ecosystems. These policies require that such restoration be accomplished using a process that includes science, planning, and public involvement. These policies strongly encourage adopting a management program that emphasizes cooperation and collaboration with partners.

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