



National Park Service  
U.S. Department of the Interior  
Saguaro National Park

## **Finding of No Significant Impact Restoration Management Plan**

### **Background**

In compliance with the National Environmental Policy Act, the National Park Service (NPS) prepared an Environmental Assessment (EA) to examine alternatives and environmental impacts associated with the proposal to implement a programmatic Restoration Management Plan (RMP) in Saguaro National Park (SNP) to address the increase of invasive non-native plant populations and other large-scale or remote disturbances. This Finding of No Significant Impact (FONSI) documents the decision to adopt the RMP, and outlines the determination that no significant impacts on the human environment are associated with this decision. Mitigation measures designed to avoid or minimize impacts to park resources and a summary of agency coordination and public comment are also provided.

### **Purpose and Need**

The vegetation communities the park was established to protect are under threat by the spread of invasive non-native plants, such as buffelgrass, that displace native vegetation, increase the potential for wildfire in the desert, and threaten the native ecosystems that the park was established to protect. SNP has found that the ground-based restoration techniques currently used to treat invasive non-native plants are inadequate to keep pace with their spread, and new treatment methods are needed to stop degradation of important park resources (e.g., saguaros and other Sonoran Desert plants). Approximately 2,000 acres of the park are currently infested with buffelgrass, and only about 500 acres are accessible for ground-based restoration treatments. This leaves the majority of the threat unmanaged, and park resources at risk. If these remote infestations are left untreated, research indicates that buffelgrass has the potential to spread throughout most of the park below 5,000 feet in elevation and displace the native Sonoran Desert plant communities. Additional restoration techniques are needed to treat and restore areas impacted by invasive non-native plants, wildfire, and other large-scale and/or remote disturbances that can destroy native vegetation, cause extensive soil erosion, and degrade water sources and wildlife habitat, including sensitive riparian areas. This plan will serve as a decision-making tool that will enable SNP to more effectively:

1. Restore ecosystem processes, structure and function in disturbed areas;
2. Maintain ecosystem processes, structure and function in undisturbed areas;
3. Maintain and restore wilderness character, reducing negative impacts from human actions;
4. Establish a decision-making process for identifying and implementing effective and appropriate (i.e., the least impact to provide the desired results) restoration strategies and treatments; and
5. Protect human health and property within and outside SNP by implementing best management practices.

## **Selection of the Preferred Alternative**

The EA examined two alternatives; the No Action Alternative (NAA) and the Proposed Action Alternative (PAA). The PAA is SNP's Preferred Alternative (PA) and the Environmentally Preferable Alternative, and will be implemented because it meets SNP's restoration needs and objectives, and is consistent with other SNP plans. Because no new issues, additional reasonable alternatives, or feasible mitigation measures were suggested during the public review process, none of the comments necessitate changes to the PA.

The PA will enable the park to restore disturbed areas of any scale (small or large), and sites that are currently inaccessible due to their remote or unsafe locations (i.e., too far from a trail to be accessed in a single work day, or too steep to have crews work safely in the area). This alternative is the most comprehensive for implementing restoration treatments and activities to manage invasive plants, stabilize soils, and re-establish native vegetation; and for mitigating the impacts from disturbances, such as fire and invasive non-native plants.

## **Restoration Strategies**

Overall restoration strategies (i.e., passive, facilitated or active) and the specific techniques used to restore damaged parklands depend on a variety of factors, including the location, type and extent of damage, type and health of surrounding native plant communities, and soil characteristics. Decisions are based on professional experience, input from desert restoration experts, and published literature. Each site is unique, and restoration strategies vary greatly in their resource requirements and intensity. The steps for selecting the most effective and appropriate strategy for a given site are outlined below.

- *Passive* restoration is recommended when disturbance is minimal, and/or for sites that are expected to recover naturally, within one to two growing seasons. This is a natural approach to restoration that focuses on monitoring, allowing for natural recovery, and intervening minimally, only when necessary. Sites are monitored to establish that desirable native species are recovering, and for the presence of invasive plants, which are removed as detected. Interventions could include installation of barricades or signs to prevent public access into recovering areas (i.e., prevention and education). There is minimal, if any, use of manual and mechanized treatments. If monitoring indicates that the native plant response is poor after the second growing season, a facilitated or active restoration strategy may be employed.
- *Facilitated* restoration is recommended when disturbance at a site is moderate, and native vegetation response is expected to occur in two to three growing seasons. Sites are monitored for native plant recovery, soil erosion, the presence of invasive plants, and treatment effectiveness. Facilitated restoration requires some degree of intervention to assist the native plant community towards a desired condition. Facilitated treatments include prevention and education, use of native seeds and/or live plant material available around the disturbed area to encourage re-vegetation, and ground-based manual and mechanized activities, including herbicide applications. As with passive restoration, if monitoring indicates that the native plant response is poor after the third growing season, a more active restoration strategy may be employed.
- *Active* restoration is recommended when disturbance at a site is high and the native vegetation response is expected to be moderate to slow, or it may not recover at all without intervention. Active strategies are a more aggressive approach to restoration, and include any or all treatments covered in the Restoration Plan. Local, as well as off-site materials could be used to encourage native re-vegetation. As above, sites are monitored for native

plant recovery, soil erosion, the presence of invasive non-native plants, and treatment effectiveness.

## **Restoration Treatment and Activities**

### *Prevention and Education*

Prevention and education treatments are actions that influence human behavior to prevent degradation or further degradation of disturbed sites. These treatments include but are not limited to: public education (displays, brochures, handouts and information on social media), signage, area closures, fencing or other barriers to exclude access or to delineate roads or trails, and cleaning equipment to remove material that might contain seeds or plant propagules before entering the park.

### *Manual*

Manual treatments consist of using hand tools and other non-mechanized equipment to remove invasive non-native plants and/or restore sites. Manual treatments include, but are not limited to: pulling, raking, digging, picking, shoveling, stabilizing hillsides or channels, removing sediment, and applying herbicides by use of a backpack pump sprayer.

### *Mechanized*

Mechanized treatments employ gas, electric or battery powered equipment to restore sites (e.g., mowing, plowing, drilling, pumping, using motorized vehicles for support, or to spread seeds or till/loosen compacted soil, and motorized pumps for herbicide spraying). Aerial treatments include use of a helicopter or fixed-wing aircraft for aerial seeding and aerial mulching, and aerial delivery of water and supplies to remote or otherwise inaccessible areas. Conditions for the use of aircraft in wilderness areas were further analyzed in a Minimum Requirements Decision Guide (MRDG), an analysis guideline for determining the least intrusive method to achieve management goals in wilderness.

### *Herbicides*

Herbicides are currently used during both manual and mechanized treatments in SNP. During manual treatments, herbicides are applied with hand-held spray wands attached to a hand-pressurized backpack spray apparatus. Mechanized herbicide treatments are also delivered by hand-held spray wands, but the herbicide is contained in a larger tank pressurized by an electric motor and transported by a motorized vehicle. Aerial herbicide treatments include use of a helicopter. All personnel working with herbicides are required to read and adhere to SNP's Herbicide Training and Safety Plan. Herbicides are classified according to their mode of action, which is determined by their active ingredients. The active ingredients and modes of action of herbicides that are considered for use in the park are summarized in the EA. Only EPA-approved herbicides will be used per the label. The park is required to keep accurate records about the amount of chemical used and the total acreage to which it is applied. Computerized records are submitted to the regional office on an annual basis.

## **Mitigation Measures/Best Management Practices**

The following Best Management Practices will be implemented during restoration management activities under the PA as needed to minimize the degree and severity of adverse effects.

- Aerial applications of herbicides will be used to treat steep and/or otherwise inaccessible sites. Sites greater than one acre in size would employ a helicopter with a boom sprayer; sites less than one acre would entail spot precision application (such as with a "ball sprayer").

- Aerial applications of herbicide will **not** take place when invasive non-native infestations are:
  - Less than 50% plant cover of the disturbed area;
  - Above 6,000 feet (1,830 meters) elevation;
  - Within the designated exclusion zone for each district (see figures 10 and 11 in the EA);
  - Within 165 feet (50 meters) of a spring, perennial channel, or any other surface water at the time of treatment;
  - Within 1/4 mile (0.4 kilometers) of an occupied structure;
  - Within 1/4 mile (0.4 kilometers) of a trail, campground or picnic area; or
  - Within 1/8 mile (0.2 kilometers) of private land, even if unoccupied;
- To minimize herbicide drift:
  - The lowest pressure, largest droplet size [volume median diameter (VMD) would be >600 µm [(micrometer)], and largest volume of water permitted by the label to obtain adequate treatment success will be used;
  - The lowest spray release height safely possible will be used; and
  - Windspeeds will not exceed 10mph during treatments.
- Herbicide delivery aircraft will be equipped with a differential global positioning system (DGPS) that records both the position of the aircraft and the status ('on' or 'off') of the spray boom.
- Herbicide delivery aircraft will be equipped with a spatially registered flow controller that compensates for variation in aircraft speed (as the aircraft flies up and down over rugged terrain) to ensure even delivery of herbicides.
- Aircraft mounted sprayers will use Accu-flow or similar nozzles to regulate the amount of herbicide delivered and minimize drift.
- All herbicide label instructions will be followed.
- Aircraft delivering any restoration treatment will **not fly**:
  - Within 345 feet of a Mexican Spotted Owl Core Area or other known roost site; or
  - Within 1/4 mile of the centerline and a minimum of 500 feet above Rincon or Chimenea creeks during southwestern willow flycatcher or western yellow-billed cuckoo breeding seasons.

## Alternatives Considered and Dismissed

The alternatives listed below were considered, but dismissed for the reasons described.

### Use of Backcountry Crews in Spike Camps to Treat Remote Sites

Current ground-based crews are working as far from roads and trails as is safe and feasible. Deploying crews into the backcountry to apply ground-based herbicide would require them to hike to, or helicopters to drop them off at, remote campsites for four to six days at a time. Crews would have to travel each day from their camp to work sites. Because many areas infested with non-native invasive plants are not adjacent to park trails, and are in rough terrain that precludes the use of pack mules, additional helicopter flights would be needed to deliver supplies, large quantities of water (for mixing with herbicides, drinking, and washing), food and camping gear, and later backhauling the supplies and equipment out of the area. These camp sites would create environmental impacts and require additional restoration work.

Approximately 1,500 acres of invasive non-native plant infestations are beyond the reasonable and safe reach of ground-based treatments. These infestations exist on some of the steepest slopes in the park and would remain untreated because it is impossible to safely access them and conduct restoration treatments. This alternative was dismissed due to its technical and economic infeasibility, inability to meet the project objectives (i.e., invasive non-native plant infestations on steep slopes), and additional environmental and wilderness impacts.

#### Use of Aircraft to Apply Seeds and Mulch but not Herbicides

The use of aircraft for seeding, mulching, and delivering soil improvements would address post-fire and other large-scale disturbances that cause erosion in remote areas, but it would not address invasive non-native plant infestations, a critical restoration need of SNP. This alternative was dismissed because it would not meet project objectives.

#### Use of Prescribed Fire

The use of prescribed fire to control invasive plants is a common practice in some regions; however, the Sonoran Desert, where most of the park's invasive non-native plant infestations occur, is not fire adapted so native species, including saguaros, would be harmed. Furthermore, the non-native grasses that infest the Sonoran Desert are fire-adapted and usually re-establish quickly after a fire. The use of prescribed fire in the lower elevations of the park would not achieve restoration goals and would be an additional disturbance that would require restoration. This alternative was dismissed because it would not meet project objectives.

#### Use of Aircraft Only for Restoration Treatments

Using only aircraft to implement restoration treatments (with no ground-based efforts) would not be feasible, effective or efficient for restoring small, accessible disturbed sites. This alternative was dismissed because of its technical and economic infeasibility, and inability to meet project objectives.

#### Restricting the Use of Aircraft to Treat Non-wilderness Areas Only

Seventy-eight percent of SNP is designated wilderness. Restricting aerial treatments to non-wilderness areas would not only ultimately harm the "wilderness character" and "naturalness" of wilderness areas in the park, but would negatively affect the ecological integrity of the entire park. This alternative was dismissed because it would not meet project objectives.

#### Use of Biological Control

Use of biological control to address invasive non-native plants would be considered; however, there is currently no known or approved biological control agent for use against the non-native grasses in SNP. If a safe and reliable biological control agent is identified in the future, its use would be considered in a separate analysis process. This alternative was dismissed because of its technical infeasibility and inability to meet project objectives.

### **Environmentally Preferable Alternative**

According to the CEQ regulations implementing NEPA (43 CFR 46.30), the environmentally preferable alternative is the alternative "that causes the least damage to the biological and physical environment and best protects, preserves, and enhances historical, cultural, and natural resources. The environmentally preferable alternative is identified upon consideration and weighing by the Responsible Official of long-term environmental impacts against short-term impacts in evaluating what is the best protection of these resources. In some situations, such as when different alternatives impact different resources to different degrees, there may be more than one environmentally preferable alternative."

The PA is the environmentally preferable alternative because ground-based restoration efforts are limited to treating small, accessible disturbed sites only. Buffelgrass is spreading faster than ground-based control efforts can keep pace with, and is not being treated at all in areas inaccessible to ground crews. The spread of buffelgrass is resulting in displacement and loss of native plant and animal species, alteration of the soil nutrient cycle, and increased threat of wildfire and subsequent ecosystem conversion. Using ground-based crews to treat very remote and/or steep areas of the park would threaten human health and safety. Aerial delivery of restoration treatments will cause the least damage to the biological and physical environment,

and best protect, preserve, and enhance natural and cultural resources, and park values, making it the environmentally preferable alternative.

### **Why the Preferred Alternative Will Not Have a Significant Effect on the Human Environment**

As defined in 40 CFR §1508.27, significance is determined by examining the context (including duration) of an impact, and its intensity, including a consideration of the criteria that follow. Based on the analysis in the EA, which is summarized in the following sections, the NPS has determined that the preferred alternative can be implemented without significant adverse effects. All impact threshold definitions (negligible, minor, moderate, major) referred to in this FONSI are defined in the EA.

***• Impacts may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.***

No major adverse or beneficial impacts were identified that would require additional analysis. Implementation of the PA may result in some adverse impacts; however, the overall benefit of the project outweighs the adverse effects. The potential adverse effects are summarized as follows. Negligible to minor, short-term impacts to soil, vegetation, water resources, and wildlife will result from restoration treatments. The presence of ground crews and aircraft during restoration treatments may adversely impact the untrammelled, undeveloped, and sense of solitude values of wilderness. Best Management Practices will be implemented to offset any adverse impacts. The overall benefit of the PA includes restoration of native plants and ecosystem function in disturbed areas, a decrease in the potential for wildfires, and improved soil function and erosion control.

***• The degree to which the proposed action affects public health or safety.***

The preferred alternative including use of hand tools, mechanized equipment, chemicals, and aerial treatments have an inherent element of concern for public health and safety. The EA identifies and discusses those effects and shows the impacts will be negligible to minor. Adherence to mitigation measures designed to minimize safety risks and adverse impacts to visitors and field crews during restoration treatments will address these risks to public safety.

***• Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.***

Location-specific work plans will be prepared and some will occur within Saguaro Wilderness. Restoration work was determined a minimum requirement for administration of the area as wilderness because it best protects and restores the natural and undeveloped qualities, as well as solitude or primitive and unconfined recreation qualities of wilderness character while minimizing impacts to the untrammelled wilderness quality. The preferred alternative will not impact prime or unique farmlands, wetlands, wild and scenic rivers, cultural landscapes, or ecologically critical areas. Mitigation measures will be implemented to minimize potential for adverse impacts to unique characteristics of SNP.

***• The degree to which the effects on the quality of the human environment are likely to be highly controversial.***

During the public scoping and EA review, some concern was expressed regarding the use of herbicides in general, as well as the aerial delivery of herbicides. The analysis in the EA addresses herbicide toxicity, drift, and potential impacts to native plants and animals. Despite this analysis, and specified mitigations and best management practices, some commenters still had these concerns.

- ***The degree to which the possible effects on the quality on the human environment are highly uncertain or involve unique or unknown risks.***

There were no highly uncertain, unique, or unknown risks identified during preparation or public review of the EA. Although some expressed concern over herbicide use, the NPS has reviewed the risk and the best available science and is committed to implementing Best Management Practices to minimize these risks.

- ***The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.***

The activities described in the PA are widely accepted restoration management practices under NPS policies. The preferred alternative neither establishes an NPS precedent for future actions with significant effects, nor represents a decision in principle about a future consideration.

- ***Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.***

Cumulative effects were analyzed in the EA and no significant cumulative impacts were identified. Cumulative impacts were assessed by combining the impacts of the PA with other past, present, and reasonably foreseeable future actions. The PA results in beneficial and adverse cumulative actions ranging in intensity from none to minor. Therefore, the PA will not contribute or result in significant cumulative impacts.

- ***The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.***

The preferred alternative will identify location-specific undertakings and could have the potential to affect cultural resources. SNP will initiate consultation with the Arizona State Historic Preservation Office (SHPO) and tribal communities for each undertaking to ensure cultural resources are considered. The undertaking will not commence until after consultation with the SHPO and associated tribal communities is complete. In the event of accidental encounter with previously undiscovered archaeological resources or historic structures, the activity will cease immediately, and consultation will occur. SNP initiated consultation on this EA and the preferred alternative in correspondence dated February 5, 2014, and the Arizona SHPO provided a finding of "no adverse effect" on historic properties on March 24, 2014.

- ***The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.***

Saguaro National Park initiated consultation on this EA in May 2012, and provided the U.S. Fish and Wildlife Service a Biological Assessment (BA) for the Preferred Alternative on February 10, 2014. On March 26, 2014, the U.S. Fish and Wildlife Service provided a letter of concurrence with the NPS determination of effect for federally listed species and species proposed for listing; that is: "may affect; not likely to adversely affect" endangered lesser long-nosed bats and southwestern willow flycatchers, threatened Mexican spotted owls and their Critical Habitat, or proposed threatened western yellow-billed cuckoo. Best Management Practices will be implemented to minimize potential impacts to these species.

• ***Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.***

The preferred alternative will not violate any federal, state or local environmental protection laws.


**Public Involvement and Native American Consultation**

The EA was made available for public review and comment during a 30-day period ending February 24, 2014. To notify the public of this review period, a postcard or a press release was sent to stakeholders, interested parties, and newspapers, and a letter was mailed to Native American tribes. Copies of the document were sent to certain agencies, interested parties, and posted on the Park's and NPS PEPC websites. Forty correspondences were received on the EA during this review period. Commenters included representatives from three conservation organizations, one federal agency, one non-governmental local organization, and 35 individuals. One response was received from a Native American tribe concurring with the finding of the EA. Seventeen commenters expressed support for the Preferred Alternative, 12 commenters expressed support for the No Action Alternative, five commenters were opposed to any use of herbicides, and six commenters had unrelated comments or did not state a preference. Comments are addressed in the Errata Sheets attached to this FONSI. The FONSI and Errata Sheets will be sent to all commenters.

**Conclusion**

As described above, the preferred alternative does not constitute an action meeting the criteria that normally require preparation of an environmental impact statement (EIS). The preferred alternative will not have a significant effect on the human environment. Environmental impacts that could occur are limited in context and intensity, with generally adverse impacts that range from localized to widespread, short- to long-term, and negligible to minor. There are no unmitigated adverse effects on public health, public safety, threatened or endangered species, sites or districts listed in or eligible for listing in the National Register of Historic Places, or other unique characteristics of the region. No highly uncertain or controversial impacts, unique or unknown risks, significant cumulative effects, or elements of precedence were identified. Implementation of the action will not violate any federal, state, or local environmental protection law. Based on the foregoing, NPS has determined that an EIS is not required for this Restoration Management Plan and thus will not be prepared.

Recommended:

  
\_\_\_\_\_  
Darla Sidles  
Superintendent, Saguaro National Park

11 APRIL 2014  
\_\_\_\_\_  
Date

Approved:

  
\_\_\_\_\_  
Sue E. Masica  
Regional Director, Intermountain Region, National Park Service

4/17/14  
\_\_\_\_\_  
(Date)

# **Errata Sheets**

## **Restoration Management Plan**

### **Saguaro National Park**

#### **Text Changes**

**Page 16** – Change statement: "At the conclusion of the meeting there was general support for the planning efforts and proposed alternative." to **"At the conclusion of the meeting there was acknowledgement of the need for further protection of the native plant communities in SNP from invasive non-native plants, although some concern was also expressed regarding the aerial delivery of herbicide treatments in the park."**

**Page 19-20** – Change statement: "Although climatologists are unsure about the long term effects of global climate change, it is clear that the planet..." to **"Although there is some uncertainty in the details of climate change, climatologists are in general agreement that the planet is experiencing a long-term warming trend..."** Also added sentence: **"The southwestern United States has been experiencing prolonged drought and unusually high temperatures."**

**Page 22** – Clarifying statement: The Use of Backcountry Crews in Spike Camps to Treat Remote Sites section was revised to reflect the rationale behind dismissing this as alternative. Added: **"Current ground-based crews are working as far from roads and trails as is safe and feasible in a day's work. Deploying crews... Because many areas infested with invasive non-native plants are not adjacent to park trails and are in rough terrain that precludes the use of pack mules, additional helicopter flights..."**

**"Approximately 1,500 acres of invasive non-native plant infestations are beyond the reasonable and safe reach of ground based treatments. These infestations exist on some of the steepest slopes in the park and would remain untreated..."**

**Page 32** – Clarifying statement: The Proposed Action Alternative section was revised to further clarify where aerial delivery of herbicides would occur. Added a phrase to the sentence: **"Furthermore, aerial application of herbicides, primarily for buffelgrass control, would be restricted to dense patches of buffelgrass (i.e., where over 50% of plant cover is buffelgrass) in areas that are inaccessible and unsafe for ground crews to treat."**

**Appendix E** – Add text: **"If an over-flight is deemed necessary in Mexican spotted owl habitat, the aircraft will not fly within a 345 foot buffer zone around any known roost site to minimize disturbance to the owls."**

**"If breeding southwestern willow flycatchers are documented in the park, aircraft delivering any restoration treatment in the park will avoid the occupied portion of Rincon or Chimenea creeks (500' above, and a minimum of ¼ mile from the centerline of the creek) during the species breeding season."**

## **Responses to Concerns and Comments**

**Several comments indicate people are concerned that the herbicides proposed for use in both alternatives are poisonous and dangerous to humans and animals (Concern #50318).**

The herbicides identified for potential use in aerial delivery for invasive plant control have an EPA toxicity level of III to IV (signal word of "caution", see Appendix F of the EA), and are not considered poisonous and pose very little risk to humans and other vertebrates.

**Herbicide drift from aerial spraying proposed in the Preferred Alternative will reach and affect/harm non-target plants and wildlife in the park, and people and animals in communities around the park (Concern #50319).**

Herbicide drift was measured and modeled during the research demonstration of aerial herbicide application in 2010 (test methods and results are presented in Appendix A of the EA). Test results showed there was no substantial drift 75 feet downwind from the one-acre spray blocks used in the trial. Computer models of these data calculated that drift resulted in 1% of the application rate at 90 feet downwind, and 5% at 75 feet (see pg. 18 of the EA). To ensure potential impacts to humans from herbicide drift are minimized, best management practices are identified in the EA, including specific delivery techniques, restrictions, and buffers (see pg. 36 of the EA).

**Two commenters requested specific information on the active ingredients and adjuvants of herbicides proposed for use in the Preferred Alternative, what formulations and concentrations of these chemicals would be used, under which circumstances, how these would be chosen, and the methods by which they would be delivered (Concern #50326).**

Choice of herbicides for use in SNP is based on balancing their effectiveness for a given target against potential environmental impacts. The park is proposing to use only Environmental Protection Agency (EPA)-approved products in approved manners. Since herbicide formulations are proprietary, the information provided on the label is all that is available.

Initial herbicide concentrations and carrier rates will be determined based on the data from the aerial spraying tests described in Appendix A of the EA. This project will be conducted within an adaptive management framework, including monitoring of vegetation (native and target) associated with the proposed aerial application. Thus, herbicide concentrations and carrier rates may be adjusted based on the monitoring results. All concentrations and carrier rates will be within the label specifications per federal law.

Aquatic herbicides are chemicals specifically formulated for use in water to kill or control aquatic plants. Herbicides approved for aquatic use by the EPA have been reviewed and are considered compatible with the aquatic environment when used according to label directions (Department of Ecology of the State of Washington, <http://www.ecy.wa.gov/programs/wq/plants/management/aqua028.html>).

At this time, imazapyr is being researched for dormant plant applications (glyphosate must be applied to green, growing plants). Imazapic, a pre-emergent, would be considered for use following a large-scale fire, after which aerial seeding would occur.

Product formulations will be the same for both types of aerial application (boom and spot sprayer).

**Several commenters expressed concern about the impacts of aerial spraying of herbicides on wildlife, including desert tortoises, and threatened and endangered species (Concern #50330).**

There is little, if any, published data on the impacts to wildlife from herbicide applications in the field, particularly in desert environments. As described in the EA, which acknowledges that animals may get sprayed or otherwise come in contact with aerially delivered herbicides, potential impacts to wildlife were based on laboratory test result summaries from National Pesticide Information Center (NPIC; <http://www.npic.orst.edu>) and Environmental Protection Agency (EPA; <http://www.epa.gov>) technical factsheets, the Nature Conservancy's Weed Control Method's Handbook (Tu et al. 2001), and the U.S. Fish and Wildlife Service's Recommended Protection Measures for Pesticide Applications in Region 2 (White 2004). Domestic animal species tested in laboratories are the best proxies for wildlife taxa of the park (i.e., invertebrates, amphibians, reptiles, birds and mammals), though laboratory test conditions are much more intensive than potential exposures to herbicides in the field. The chemicals proposed for aerial treatments of invasive non-native plants in the park are virtually non-toxic to vertebrates, and, even if sprayed directly on them, would not be expected to harm wildlife.

Wildlife at a given treatment site, particularly less mobile herbivores (e.g., desert tortoises, some rodents), may be adversely affected by a short-term reduction of cover and forage after aerial spraying, just as they might by ground-based spraying of large dense patches of buffelgrass. Cover from both killed and unaffected plants would remain for at least for several weeks after spraying. Forage would likely be reduced, but most species, even small terrestrial herbivores, would be expected to be able to move out of impacted sites within a few days. For example, desert tortoises in the park typically have home ranges of about 40 acres (Stitt et al. 2003). Currently, the largest known patch of buffelgrass targeted for aerial spraying is about 50 acres. Thus potential negative impacts were characterized as direct and indirect, site-specific to local, negligible, and short-term (see pg. 95 of the EA). Benefits would be indirect, local to regional, moderate, and long-term.

Some information regarding threatened or endangered species (e.g., locations) is sensitive, so a more detailed analysis of the potential impacts of the preferred action on listed species was prepared in a Biological Assessment and submitted to the U.S. Fish & Wildlife Service for review and concurrence (letter of concurrence received March 28, 2014). The affects determinations were the same as in the EA (i.e., "no effect" to jaguar or Gila topminnow; "may affect, but is not likely to adversely affect" lesser long-nosed bats, Mexican spotted owls or their Critical Habitat, southwestern willow flycatchers, or yellow-billed cuckoos). Regarding potential impacts to Palmer's agave (a food source of the lesser long-nosed bat), agaves are tolerant of glyphosate, and are found in relatively low densities within the proposed treatment areas (estimated less than one per hectare) and in their range in the park that overlaps with buffelgrass. Thus, aerial spraying would be expected to have negligible impacts on agave populations, and would not adversely affect lesser long-nosed bats.

**Literature Cited**

Stitt, E.W., C.R. Schwalbe, D.E. Swann, R.C. Averill-Murray, A.K. Blythe. 2003. Sonoran Desert tortoise ecology and management: effects of land use change and urbanization on desert tortoises. Final report to Saguaro National Park. Tucson, AZ

Tu, M., C. Hurd, and J.M. Randall. 2001. Weed Control Methods Handbook: Tools and Techniques for use in Natural Areas. The Nature Conservancy. Available online: <http://www.invasive.org/qist/handbook.html>. Accessed 8/2/12.

White, J.A. 2004. Recommended protection measures for pesticide applications in Region 2 of the U.S. Fish and Wildlife Service. U.S. Fish and Wildlife Service, Region 2, Environmental Contaminants Program. Austin, TX 203pp.

**Two commenters expressed concern that the Preferred Alternative could contaminate surface water, and harm aquatic and riparian resources, specifically Rincon Creek, and suggested the 165' buffer should be extended. (Concern #50329).**

Streams or other areas containing surface water that are accessible to ground-based treatments, such as Rincon Creek, would not be treated aerially. Aerial application of herbicides would not occur within a minimum of 165 feet (well beyond the distance any drift was detected during the testing of aerial delivery methods) from any surface water. In addition, Rincon Creek, which runs along the Rincon Creek Trail for most of its length below 5,000' elevation in the park, and defines a portion of the boundary of the park from adjacent private land, would receive a 1/4 mile buffer from aerial treatments.

Regardless of application method, only aquatic approved herbicides would continue to be used near streams, surface waters, saturated soil or other areas that could contain sensitive organisms such as lowland leopard frogs.

**One commenter suggested modification of a dismissed alternative (Use of Backcountry Crews in Spike Camps to Treat Remote Sites) for consideration. Related to this, another commenter requested a cost/benefit analysis of aerial versus ground-based restoration treatments.**

The use of backcountry crews based out of spike camps to treat remote sites was considered, but dismissed as an alternative (see pg. 22 of the EA). Existing ground-based crews are working as far from roads and trails as is feasible and safe. Backcountry camps are not feasible due to the rough terrain, and long-distances off-trail that would preclude the use of pack mules. Helicopters used to supply the camp would cause additional resource and wilderness impacts.

A cost/benefit analysis is not a component of an environmental assessment, which is developed to identify and assess the environmental impact of potential alternatives. However, on a straight acre for acre basis, aerial treatments are much efficient than ground-based treatments in terms of time and money. In addition, using helicopters to transport ground crews, supplies, and water to and from remote sites would require at least twice as many helicopter flights as aerial treatments, and would leave many acres of buffelgrass infestations untreated (due to steep terrain that is unsafe for crews).

**One commenter was concerned that only one of three years of data from the test plot monitoring had been used in the impact analysis of the Preferred Alternative, including impacts to wildlife; and that "Considering that many native desert plants are slow to grow and slow to respond to environmental factors, this level of analysis is totally inadequate to ensure that Park resources and non-target species will not be unduly harmed..."**

The test plots where aerial spraying was conducted and monitored outside of Tucson were established to determine the efficacy of aerial treatments to control buffelgrass, monitor post-treatment effects to native vegetation, and determine drift potential and extent. They did not address potential impacts to wildlife species.

At the time of the release of the EA, second and third year post-treatment results of the test plots were not available. Since then (in mid-March 2014) analysis of the second year of data has been released (Bean and Smith 2014), and results are consistent with findings in the first year. Data collected from the test plots in the third year post treatment, fall 2013, are still being analyzed. Thus far, data from the test plots indicate that aerial spraying is an effective treatment for buffelgrass infestations; and furthermore, that many cactus, agave, and woody plants appear to be minimally effected by glyphosate.

While desert plants are slow to respond to some environmental factors, their response to herbicide is evident much faster (and often specified on the herbicide label). The NPS acknowledges in the EA that aerial spraying may adversely affect some native plants within and next to treatment patches. For this reason, vegetation will be monitored after treatments and subsequent management decisions will be adapted to minimize negative impacts on native vegetation.

#### Literature Cited

Bean, T.M. and S.E. Smith. 2014. Completion of Report and Related Work on Results of Buffelgrass Aerial Herbicide Application Study. Progress Report: Initial Data Analyses, Results, and Description of Future Analyses. 14pp.

## Appendix A – Non-Impairment Finding

The National Park Service's *Management Policies, 2006* require analysis of potential effects to determine whether or not actions will impair park resources. The fundamental purpose of the national park system, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting park resources and values.

However, the laws do give the NPS the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the NPS the management discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement that the NPS must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values.

An impact to any park resource or value may, but does not necessarily, constitute impairment. An impact would be more likely to constitute impairment to the extent that it affects a resource or value whose conservation is:

- Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- Key to the natural or cultural integrity of the park; or
- Identified as a goal in the park's general management plan or other relevant NPS planning documents.

An impact would be less likely to constitute impairment if it is an unavoidable result of an action necessary to pursue or restore the integrity of park resources or values and it cannot be further mitigated.

The park resources and values that are subject to the no-impairment standard include:

- The park's scenery, natural and historic objects, and wildlife, and the processes and conditions that sustain them, including, to the extent present in the park: the ecological, biological, and physical processes that created the park and continue to act upon it; scenic features; natural visibility, both in daytime and at night; natural landscapes; natural soundscapes and smells; water and air resources; soils; geological resources; paleontological resources; archeological resources; cultural landscapes; ethnographic resources; historic and prehistoric sites, structures, and objects; museum collections; and native plants and animals;
- Appropriate opportunities to experience enjoyment of the above resources, to the extent that can be done without impairing them;
- The park's role in contributing to the national dignity, the high public value and integrity, and the superlative environmental quality of the national park system, and the benefit and inspiration provided to the American people by the national park system; and
- Any additional attributes encompassed by the specific values and purposes for which the park was established.

Impairment may result from NPS activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park. The NPS's threshold for considering whether there could be impairment is based on whether an action will have significant effects.

Impairment findings are not necessary for visitor use and experience, socioeconomics, public health and safety, environmental justice, land use, and park operations, because impairment findings relates back to park resources and values. These impact areas are not generally considered park resources or values according to the Organic Act, and cannot be impaired in the same way that an action can impair park resources and values. Impairment analysis for the remaining impact topics follow.

### **Soils and Surface Hydrology**

Soil is the surface layer of land that contains organic material, and may range in depth from inches to many feet. Surface hydrology is water that occurs above land, including oceans, lakes, rivers and streams, as well as the overland flow of water after rainfall or snowmelt. The purpose of SNP's restoration treatments is to stabilize soils and reduce erosion by re-establishing natural soil conditions and contours, and vegetation cover. Thus, restoration activities inherently benefit soils and surface hydrology. The PA could result in short-term, negligible to minor adverse impacts to soils and surface hydrology, mostly from trampling by ground crews, but also from herbicide contamination. Such adverse impacts are an unavoidable result of actions necessary to restore the integrity of park resources, and will be mitigated by Best Management Practices. The PA will not result in impairment because proposed restoration actions will result in moderate short- and long-term benefits to soils and surface hydrology.

### **Water Quality and Quantity**

Water quality and quantity refers to sub-surface groundwater. The purpose of restoration treatments is to stabilize soils and reduce erosion by re-establishing natural soil conditions, and vegetation cover. The PA could result in short-term, negligible to minor adverse impacts to water quality and quantity from herbicide contamination. Potential adverse impacts would be mitigated by Best Management Practices, and are an unavoidable result of actions necessary to restore the integrity of park resources. The PA will not result in impairment because proposed restoration actions will result in minor long-term benefits to water quality and quantity.

### **Vegetation**

Protecting vegetation, specifically saguaros, and other plant species of the Sonoran Desert, is one of the core elements of SNP's enabling legislation. Furthermore, NPS Management Policies state that parks will maintain all plants native to park ecosystems, and that invasive non-native species will not be allowed to displace native species if that can be prevented. The purpose of SNP's restoration treatments is to stabilize soils and reduce erosion by re-establishing natural soil conditions and contours, and native vegetation cover. Thus, restoration activities inherently benefit vegetation. The PA could result in short-term, negligible to minor adverse impacts to native vegetation from trampling by ground crews and herbicides. Such adverse impacts are an unavoidable result of actions necessary to restore the integrity of park resources, and will be mitigated by Best Management Practices. The PA will not result in impairment because proposed restoration actions will result in moderate long-term benefits to vegetation.

### **Wildlife**

Protecting the wildlife and wildlife habitat of the Sonoran Desert and Rincon Creek is specifically mentioned in SNP's enabling legislation. Furthermore, NPS Management Policies state that parks will maintain all animals native to park ecosystems, and that invasive non-native species

will not be allowed to displace native species if that can be prevented. The purpose of SNP's restoration treatments is to re-establish native vegetation and wildlife habitat. Thus, restoration activities inherently benefit wildlife. The PA could result in short-term, negligible to minor adverse impacts to native wildlife, mostly from disturbance from ground crews, but also from herbicides. Potential adverse impacts are an unavoidable result of actions necessary to restore the integrity of park resources, and will be mitigated by Best Management Practices. The PA will not result in impairment because proposed restoration actions will result in moderate long-term benefits to wildlife.

#### **Threatened or Endangered/Sensitive Species**

Four federally listed T&E species occur in SNP at least occasionally, and an additional 24 species with special status in the state, county or park may be found in SNP. NPS Management Policies state that parks will "survey for, protect, and strive to recover federally listed native species," as well as "manage state and other locally listed species in a manner similar to its treatment of federally listed species to the greatest extent possible." The purpose of SNP's restoration treatments is to re-establish native vegetation and wildlife habitat. Thus, restoration activities inherently benefit federally listed and other special status plant and animal species. The PA could result in short-term, negligible to minor adverse impacts to native wildlife, mostly from disturbance from ground crews, but also from herbicides. Potential adverse impacts are an unavoidable result of actions necessary to restore the integrity of park resources, and will be mitigated by Best Management Practices and specific conservation measures. The PA will not result in impairment because proposed restoration actions will result in moderate long-term benefits to federally listed and special status species.

#### **Wilderness**

Approximately 78% of SNP was formally designated wilderness in 1976. It is managed under the provisions of the Wilderness Act of 1964 and totals 70,905 acres. Work plans will identify sites requiring restoration, many of which will occur within or adjacent to wilderness. Aerial delivery of restoration treatments and supplies could result in short-term, minor to moderate adverse impacts to the untrammeled, undeveloped, and opportunities for solitude or unconfined recreation wilderness values of wilderness. Such adverse impacts are an unavoidable result of actions necessary to restore the integrity of park resources, and which cannot be further mitigated. The PA will not result in impairment because proposed restoration actions will result in moderate, long-term benefits to natural and "other features" wilderness values.

#### **Cultural Resources and Landscapes**

Protection of "important archeological and cultural sites" is specified in SNP's enabling legislation; and several federal laws and NPS management policies mandate the preservation and protection of cultural resources. The biggest threats to SNP's cultural resources, including archeological sites, historic buildings and structures, and cultural landscapes, are from erosion and wildfire. The purpose of SNP's restoration treatments is to stabilize soils and reduce erosion by re-establishing natural soil conditions and contour, and native vegetation. Eradication of invasive non-native plants, particularly buffelgrass, also reduces the threat of wildfire. Thus, proposed restoration activities inherently benefit cultural resources. The PA could result in short-term, negligible to minor adverse impacts to cultural resources from inadvertent disturbance from ground crews; however such impacts would be rare since restoration sites are surveyed for cultural resources before treatments, and avoided and/or potential impacts mitigated by Best Management Practices. The PA would also have moderate, long-term benefits to cultural resources and landscapes.

In conclusion, as guided by this analysis, good science and scholarship, advice from subject matter experts and others who have relevant knowledge and experience, and the results of public involvement activities, it is the Superintendent's professional judgment that there will be no impairment of park resources and values from implementation of the preferred alternative.