National Park Service

U.S. Department of the Interior

Grand Canyon National Park
Arizona

EXOTIC PLANT MANAGEMENT PLAN
FINDING OF NO SIGNIFICANT IMPACT

Grand Canyon National Park (GRCA) proposes to use Integrated Pest Management (IPM) techniques to control and contain exotic plant species within park boundaries. Currently, 189 exotic plant species are known in GRCA; of these, 82 are of serious concern. These exotic plant species displace natural vegetation and, consequently, affect long-term health of native plant and animal communities. Proposed actions include the use of IPM techniques; efforts to increase education, prevention and collaboration; and use of manual, mechanical, cultural and chemical controls.

Action Objectives

1. Reduce exotic plant cover by 50% within GRCA's development zone and disturbance corridors over the next ten years (2009-2019)
2. Conduct exotic plant surveys in 25% of GRCA's natural zone priority areas over the next ten years (2009-2019)
3. Identify and control small populations of the most invasive and potentially threatening species park-wide
4. Prevent further introductions of exotic plant species already present in GRCA by increasing visitor and staff awareness through education
5. Initiate projects to enhance park visitor experience and aesthetics
6. Increase cooperation and coordination with adjacent land owners and agencies

In February 2009 the National Park Service (NPS) completed an *Environmental Assessment (EA)* for the *Exotic Plant Management Plan.* This EA, in accordance with the National Environmental Policy Act (NEPA), analyzed impacts that will likely result from project implementation. The EA evaluated one action alternative to address the purpose and need for action (Alternative 2), and taking no action (Alternative 1, No Action) for comparison with the action alternative. Alternative 2 is the Preferred Alternative.

PREFERRED ALTERNATIVE

The Preferred Alternative includes expansion of IPM techniques to include those available both now and in the future for proactive, adaptive, responsible integrated exotic plant management, as funding permits.

Components of Alternative 2 include increased education, collaboration, planning and prevention; increased chemical use as appropriate; and fire treatment use. Other types of IPM techniques including biological control are not included in the Preferred Alternative but may be considered in the future and analyzed in a separate NEPA document.

The Preferred Alternative includes

- Prioritization and Planning
- Early Detection and Prevention
- Treatments
- Monitoring and Record Keeping

PRIORITIZATION AND PLANNING

Planning efforts will include use of a Decision-making Tool and continued use of annual work plans.

Decision-making Tool and Prioritization

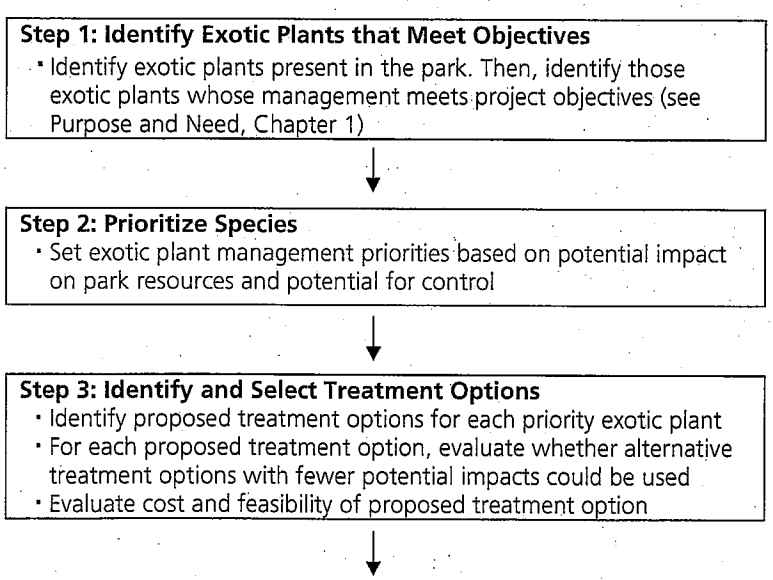
GRCA will use the following Decision-making Tool to prioritize and determine exotic plant species treatment. The Vegetation Program currently prioritizes exotic plant species for treatment using an IPM technique; however, the decision-making process has not been documented.

In using this tool, Vegetation staff will follow a standard decision-making process to

- identify exotic plants meeting above project objectives
- prioritize as new species enter and others are treated successfully
- identify and evaluate proposed treatment efficacy and environmental effects
- consider alternative treatments with less impacts
- justify why a treatment was selected
- confirm compliance with applicable policies and regulations

Process outcomes will provide each annual work plan's foundation. GRCA will also use results to explain to the public how each factor was accounted for in selected treatment methods. Figure 1 provides an overview of the decision-making tool. The decision-making process is described in detail below.

Figure 1 Decision-making Tool



Step 4: Confirm Compliance of Chemical Treatments with Applicable Regulations
- If chemical treatments are selected, confirm use is compliant with applicable regulations and policies (Appendix A)

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Step 5: Confirm Compliance of Treatment Method with an Existing NEPA Document
- Prior to implementing selected treatment, confirm selected treatment method has necessary NEPA compliance

Step 1 Identify Exotic Plants That Meet Project Objectives

This step identifies exotic plants that meet at least one project objective which are desired outcomes the park wants to achieve, and are specific. Overall effectiveness of the exotic plant management program can be evaluated against these objectives. GRCA Vegetation Program staff will also review objectives on a regular basis to address ever-changing exotic plant management issues.

As described in Management and Planning History, Chapter 1 of the EA, GRCA's General Management Plan (GMP) separates the park into three management zones: development, natural and cultural.

In the development zone, including South and North Rim, Tuweep and developed Inner Canyon sites, priority areas include roads, trails, previously identified exotic treatment areas, entrance stations, railroad tracks, campgrounds, stock use areas and around rim lodges where heavy traffic exists. In the natural zone, over 90% of the park, priority areas include tributaries, roads, trails, backcountry campsites, the river corridor and other areas with greater human influence or visitation. The cultural zone is not specifically identified in the EA; instead cultural resources will be considered throughout the park, in both development and natural zones.

In addition, exotic plants would be managed in residential areas and throughout identified cultural landscapes. GRCA housing policy would be revised to identify species that cannot be planted or brought into the park by residents. Invasive species planting by residents would not be allowed. Previously planted invasive plants could be removed based on species priority.

NPS Management Policies restricts management to only those exotic plants whose management is prudent and feasible. The exotic plant must currently, or have potential to, meet at least one of the following criteria:

- interfere with natural processes
- disrupt genetic integrity of native species
- disrupt accurate presentation of cultural landscapes
- damage cultural resources
- hamper management of park or adjacent lands
- pose a health hazard or create a hazard to public safety

Step 2 Prioritize Species
This step assists the park in determining priority species based on potential impacts to park resources and potential for controlling the exotic plant. Instead of using only the Alien Plant Ranking System (APRS), high priority for control will be given to exotic plants that meet any of these criteria:

- Rank high using APRS. Essentially, species with a high level of impact are able to become invasive and are feasible to control
- Are considered a disruptive species in GRCA
- Rank high on Arizona's list of invasive plants that threaten wildlands
- Are listed on Arizona's noxious weed list
- Are listed by the state and/or county as high priority for eradication or control
- Affect biodiversity or ecosystem processes
- Threaten rare plant species in the park
- Occur in developed or other areas where seed can be rapidly dispersed to other park areas
- Threaten integrity of an historic landscape
- Occur within 0.5 mile of park boundary and threaten to spread onto neighboring lands; or
- Are new exotic plant species infestations that have never occurred in the park

Appendix B of the EA provides a list of prioritized exotic plant species found in GRCA; however, this list is not static and will change based on new information and studies, park priorities and exotic plant management status throughout the park.

Step 3 Selection of Treatment Options
GRCA will select treatment options for exotic species considered high priority. Treatments that are least intrusive and successful in treating high priority species will be identified. Cost, available resources, impacts and effectiveness will be considered. If more than one treatment option is identified feasible and effective, the treatment with least impact will be selected.

Treatment options beyond those described in the EA will be considered if the treatment has similar impacts to those described in the EA's Chapter 3 analysis. If additional impacts are expected, additional NEPA documentation will be required as described in Step 4 below.

Step 4 Confirm Compliance for Chemicals
If chemical application is selected as the treatment method, Vegetation Program staff will need to confirm these treatments are justified and compliant with NPS policies. Requirements include

- *NPS Management Policies* requires a designated IPM specialist also confirm the need for chemical treatment
- NPS-77 (Natural Resources Management Guideline) requires chemicals be registered by the U.S. Environmental Protection Agency (EPA)
- Pesticides must be used in accordance with product labels
- Some pesticides have restrictions prohibiting use under certain conditions. Pesticides with restrictions would only be used for sites that meet conditions specified on the product label

- Pesticide use proposals (PUPs) must be submitted to the Regional IPM Coordinator prior to use

All of these requirements will be met if chemical treatment is selected.

Step 5 Confirm NEPA Compliance of Proposed Treatment Method
This step will confirm the selected treatment method complies with NEPA. The Vegetation Program Manager will confirm the selected treatment method has been adequately analyzed. If there is a question about NEPA adequacy, the Vegetation Program Manager will consult the park's Office of Planning and Compliance.

The following will be asked for each proposed exotic plant management treatment

- Is the selected treatment included in the GRCA Exotic Plant Management Plan (EPMP) or another approved plan and accompanying NEPA document?
- Are potential selected treatment impacts consistent with the GRCA EPMP or another approved plan and accompanying NEPA document?
- Is the EPMP or another approved plan and accompanying NEPA document accurate and up-to-date?

If selected treatment(s) comply with approved GRCA EPMP or another NEPA document, documentation of this will be included in the annual work plan. GRCA will specifically review the scope of work each year to assess impacts to cultural resources and special status species. If impacts beyond those identified in Chapter 3 of the EA would result, additional compliance and consultation will be completed, and/or mitigations measures implemented.

If proposed treatment method has not been adequately addressed in the EPMP or in another NEPA document, preparation of a new document will be required to comply with NEPA.

Annual Work Plans
Annual work plans will be developed to guide exotic plant management actions. In 2008, a complete work plan for all park exotic plant management was developed. A similar plan will be completed each year to identify project areas, site specific survey information, monitoring and exotic plant removal protocols, herbicide details, safety information, blank data forms and any additional project-specific information. Work plans will not only guide Vegetation staff, but will also serve as a communication tool with other resource concerns including sensitive species, wilderness and cultural resources.

EARLY DETECTION AND PREVENTION
Early detection and prevention actions currently implemented include public and employee education, and community outreach and collaboration within the park and beyond its boundaries. Additional prevention actions identified in the EA will include increased education, communication and collaboration; expanded mitigation measures; and park-wide exotic plant surveys.

Education

The current Vegetation Program has incorporated education through volunteer programs, publications and both formal and informal presentations. Some of the highlights include

- Over 9,500 hours of volunteer time devoted to controlling exotic plant species in Fiscal Year 2007
- Articles in *The Guide*, a quarterly publication provided to park visitors, highlight the program's invasive plant management work
- Site Bulletins for tamarisk management work, Himalaya blackberry removal and backcountry invasive plant management efforts
- A pamphlet titled *Fight the Invasion! Controlling invasive plant species at Grand Canyon National Park* is provided to backcountry visitors and the general public
- A brochure titled *Invasive Plant Species Observation* is given to GRCA employees and backcountry guides during training
- A pamphlet titled *What's in Your Backyard* is provided to park residents in an effort to increase awareness and encourage hands-on participation in invasive plant removal efforts
- Vegetation staff contributes education and outreach at the local school
- Vegetation staff works with interpretative staff to implement a School-to-Work curriculum at Grand Canyon School
- Trainings are provided to GRCA work groups throughout the year
- Vegetation staff give presentations to Grand Canyon Field Institute guides, college and university groups, local organizations (i.e., Rotary, Master Naturalists) and other groups upon request

The Vegetation Program will increase efforts to inform the public and staff about exotic plant species and park management strategy. Potential methods to increase visitor and staff awareness include

- Promoting and supporting interpretive programs
- Promoting and expanding in-school programs
- Designing visitor center and orientation plaza displays and additional brochures and site bulletins
- Developing a training manual for identification and control of invasive plants in the park's developed areas for park staff
- Updating exotic plant species information on GRCA website
- Preparing additional press releases each year
- Submitting additional articles for publication
- Providing hands-on training opportunities for NPS employees
- Participating in other agency vegetation management trainings
- Developing cross-training opportunities with neighboring park units
- Including exotic species information with backcountry and river permits
- Possibly requesting all backcountry staff and visitors visit seed brushing stations at trail heads prior to entering the backcountry

GRCA will continue to work with volunteers to control exotic plant species, and seek to expand the volunteer program.

Collaboration

In a proactive effort, GRCA has joined Federal, state and local government agencies, tribal governments, private landowners, non-profit organizations, businesses and other partner organizations to develop joint strategies to curb the exotic plant threat.

GRCA participates in the Northern Arizona Weed Council, a partnership among public and private organizations and individuals to promote cooperation and coordination. Vegetation staff contributes information to the San Francisco Peaks Weed Management Area (WMA), the Moenkopi WMA, and the Arizona Strip WMA. Due to GRCA's size, the Vegetation Program intends to form a separate Grand Canyon WMA in the future.

Vegetation staff participated in the Arizona Wildlands Invasive Plant Working Group's efforts to prioritize state invasive exotic plants. GRCA is a collaborator with the Southwest Exotic Plant Information Clearinghouse (SWEPIC) and provides annual invasive plant management information for the regional database.

GRCA biologists coordinate invasive plant management efforts with Glen Canyon National Recreation Area (GLCA) staff. GRCA conducts several exotic plant management projects a year at Lees Ferry where GRCA and GLCA boundaries overlap. GRCA hosts one- to two-week work projects for regional NPS Exotic Plant Management Team (EPMT). The EPMT is a mobile task force providing on-the-ground support for park invasive plant management efforts.

GRCA communicates with Arizona Department of Transportation (ADOT) regarding exotic plant management efforts on roads directly outside park boundaries. Vegetation staff also works closely with Kaibab National Forest regarding overlapping concerns and projects, particularly in Tusayan and Desert View areas. GRCA and Grand Canyon Railroad are currently working on plans to treat persistent invasives along park railroad tracks to minimize fire hazard and address invasive species.

Increased collaboration will include efforts to coordinate exotic species management with the U.S. Forest Service, work more closely with Arizona Department of Transportation and consultation with sister parks in Mexico and China.

Project Mitigation Measures

All compliance documents for park projects assess exotic plant species risks, analyze potential treatment of high-risk sites for invasive plant establishment and spread and identify prevention techniques. These prevention techniques or mitigation measures limit introduction and spread of exotic plant species. Mitigation measures include pressure washing vehicles and equipment entering the park, approved fill material use, pre-construction exotic plant surveys and post-construction site restoration.

Vegetation Program staff work closely with other park staff to ensure sufficient funding is included in construction-related projects. Vegetation staff attends pre-construction meetings to stress importance of exotic plant prevention measures.

Mitigation measures will be expanded to include

- Use only fill and gravel free of high priority invasive plant seed in all park construction and maintenance activities

- Request all construction equipment be cleaned prior to entering the park to prevent introduction of exotic plant seeds
- All hay and forage must be weed seed free. This mitigation measure would be enforced after the Weed Seed Free Hay and Forage Standard Operating Procedure, currently under review by park management, is finalized

GRCA Vegetation Program staff will also review and amend park Construction Guidelines to include more detailed mitigation measures as developed. Staff will visit all potential borrow pits spring and fall yearly to complete exotic plant species surveys. Vegetation Program leads will work more closely with park staff to ensure adherence to mitigation measures.

Coordination with GRCA Fire Activities

Fire has potential to introduce and spread exotic plant species. Fire timing and plant lifecycles are important variables in exotic species establishment. Alternative 2 proposes the Vegetation Program work with GRCA Fire Program to prevent and/or manage invasive exotic plant populations efficiently and effectively. Where implementation of these programs overlap, staff will track dates and dual treatment prescriptions (i.e. hand pull and prescribed burn) and map locations. Other efforts will include

- Provide invasive plant awareness and prevention training and educational materials to GRCA Fire Program staff and Resource Advisors. Resource Advisors would be responsible for presenting information to the Incident Management Team when wildfire or control operations occur in or near a noxious weed area, and to Burn Rehabilitation Teams when applicable
- Provide exotic plant spatial data to Fire Program semi-annually to inform planned and unplanned fire management
- Clean fire vehicles, equipment and clothing in compliance with park-wide policy
- Locate control lines, helispots, fire camps and other soil disturbing fire management activities to minimize introduction and spread of exotic plant species
- Inspect helispots, staging areas, incident command posts/base camps, etc., periodically to minimize exotic species introduction
- Use Minimum Impact Suppression Techniques (MIST) to reduce disturbances to soil and vegetation
- As fire crews conduct pre-burn assessments and install fire effects monitoring plots, they will gather invasive plant species information, assess potential risks and share data with the Vegetation Program
- Rehabilitate affected sites (i.e., control lines, staging areas and helispots) as soon as possible following disturbance. Develop Burned Area Emergency Rehabilitation (BAER) plans as appropriate.
- Procure certified weed-seed free mulching materials and native plant seed used in fire rehabilitation

Surveys

Annual surveys of priority areas throughout the park, as described under management zones in Chapter 1 of the EA, will be completed to identify exotic plant locations. These surveys will be more in-depth and extensive than previous efforts.

TREATMENTS

Exotic plant treatments will include cultural, manual, mechanical and chemical.

CULTURAL TREATMENTS

Cultural treatments are practices that promote growth of desirable plants and reduce opportunities for exotic plants to grow. Treatments include seeding, planting, prescribed fire, livestock exclusion, use of flood techniques, manual addition of carbon sources (e.g. sugar and sawdust), and mulching. GRCA will use the following cultural treatments: seeding, mulching, restoration, additional carbon sources and barriers, increased restoration and fire treatments. Other cultural treatments considered include hot water and similar low-impact techniques as they are developed.

Seeding (including post-fire seeding) ***Cultural Treatments***

Seeding is used to encourage re-establishment of native plants and prevent establishment of exotic plants. Seeding is not required in areas where native plant diversity is adequate within and surrounding treated exotic infestations. GRCA will increase native plant seed collection and storage for future restoration. Seed collection and seeding will focus on genetic integrity maintenance. Vegetation staff will initiate efforts to install native grass seed production fields in the park. Areas disturbed by construction or fire activities, for example, will be seeded as soon as possible, dependent, however, on seed availability.

Mulching and Use of Additional Carbon Sources ***Cultural Treatments***

Mulching is used in disturbed areas to promote water retention and reduce exotic plant species competition. Mulch is generated in the park; trees cut for construction projects, fire management activities or as part of the hazard tree management program are chipped and stockpiled for mulch. Vegetation crews will use mulch and also consider use of other carbon sources (e.g. sugar or sawdust) to control nitrogen-loving exotic plants such as brome grasses (Bromus spp).

Barrier Treatments ***Cultural Treatments***

Barriers will be placed on top of or vertically around exotic plants to inhibit growth. Various materials considered as barriers including plastic, fabric and metal. These techniques will generally be used on smaller populations to minimize impacts to surrounding native vegetation and soils.

Restoration ***Cultural Treatments***

Restoration is defined as a method used to mitigate disturbed areas or control exotic plant problems by restoring native vegetation communities that existed prior to disturbance or invasion. Methods vary depending on site and project, and include a combination of soil scarification, collection and storage of native seed, spreading of seed and mulch on site, addition of soil amendments and planting native plant species. Restoration will be expanded to include more planting of native shrubs and trees as feasible.

Fire Treatments ***Cultural Treatments***

Use of fire to treat exotic species will be considered. Pile burning, controlled burning and propane torches (also known as spot burning) will be used on a limited basis for certain species.

Pile burning involves burning a pile of plant material off the ground. Metal barrels will also be used to burn plant material. Plant material will be placed in barrels and then burned onsite. Barrels will be placed on fire-proof blankets for safety. Ashes generated in barrels will be packed out by boat or other appropriate means.

Controlled burning involves burning across an area to target a specific species or multiple species of exotic plants. A fire is ignited to spread across the controlled area and subsequently burns above-ground plant portion.

Propane torches, also known as spot burning, uses a propane flame directed at an individual plant. A thin blast of heat boils water in the cell stalk which generates pressure, the cell explodes, and a cross section of the stalk ruptures. Plant food and water cannot move from roots to leaves through the ruptured stalk and the plant withers and dies. The plant does not catch fire. The torch flame burns the target plant as opposed to starting a ground fire as in pile or controlled burning.

Currently, the only species considered for fire treatment is camelthorn along the Colorado River corridor. However, it is expected that fire will be considered for other species such as bindweed, as well. All fire treatment will be coordinated with GRCA Fire personnel.

MANUAL TREATMENTS

Manual methods include removal of entire plants below the root crown, and minimizing seed production using pruners, loppers, shears and knives to remove seed heads. Manual treatments use hand tools to cut, clear or prune herbaceous and woody species. Vegetation crews will cut plants above ground level, hand pull or dig plants to prevent re-sprouting and re-growth. Hand tools used in manual treatments will include geology picks, trowels, shovels, pulaskis, McLeods, hand saws, axes, shovels, rakes, machetes, hoes, brush hooks, hand clippers and other hand tools as needed. Although costly and labor intensive, manual treatment is species-selective and can be used in sensitive habitats and remote areas inaccessible to ground vehicles.

MECHANICAL TREATMENTS

Mechanical actions primarily involve removal of entire plants above the root crown with hand-held brush cutters and chain saws in developed areas; however, on pre-disturbed construction sites, tractors will be used to remove exotic plant species prior to site disturbance. Heavy equipment such as tractors and mowers will only be used to control large exotic plant infestations. In the future, if mechanized equipment use is determined the best alternative in backcountry areas, a Minimum Requirement Analysis will guide that decision-making process.

CHEMICAL TREATMENTS

Chemical treatments use herbicides to eliminate exotic plants or greatly reduce vigor. Herbicides can reduce photosynthesis, disrupt reproduction or interrupt production of essential proteins. Proper use of chemical herbicides is dependent on many factors including, 1) treatment objective; 2) accessibility, topography and infested area size; 3) target species life history; 4) infestation density; 5) location of sensitive species or sensitive areas in immediate vicinity; 6) application timing in relation to plant growth and weather conditions; 7) herbicide toxicity and degradation time; 8) soil attributes; and 9) cost.

Herbicide application will be scheduled and designed to minimize potential impacts to non-target plants and animals and, to ensure minimum risk to human health and safety, will follow all recommended application rates. Herbicide will continue to be used only on exotic plant species that cannot be controlled in any other feasible manner. Herbicide used in riparian areas will continue to be formulated for aquatic use, and application limited.

New species will be targeted as funding allows, limited broadcast spraying will be incorporated and additional herbicides will be used as appropriate. Table 1 includes a list of chemicals used previously and those that will be used. Additional herbicides beyond this list will be considered over the next ten years.

On a case-by-case basis, and in developed areas only, methodology will expand to include limited broadcast spraying (e.g. along railroad tracks to reduce fire hazard or around fire boundaries to prevent invasive species spread). Broadcast herbicide spraying will be used in accordance with the herbicide specimen label, and on large infestations in disturbed areas (e.g. rush skeleton weed along railroad tracks) in the development zone only. Broadcast spraying application will use a boom sprayer on a truck or rail vehicle and will spray directly on the ground in a target area. Herbicide will spray approximately eight feet behind and on either side of the sprayer as it moves down the track. This target area will only include the area necessary to accomplish a project (e.g. to reduce fire hazard along railroad tracks). Aerial spraying is not proposed for exotic plant management at this time.

Another action considered on a case-by-case basis is herbicide to treat plants for more aesthetic or safety purposes. These may include, but are not limited to, plants growing in sidewalks, curbstones, road sides related to aesthetics and medians with vegetation related to safety and specifically sight distances. Manual treatment of these plants has been completed in the past. NPS or concessioner staff will work with the park's vegetation staff to determine if proposed herbicide use will be appropriate and necessary. Vegetation staff will help decide what type of herbicide to use. Herbicide use will be tracked, and applicators trained to standards set forth in the EA. Use will be limited and only approved after careful review by Vegetation staff.

Table 1 Summary of Active Ingredients, Mode of Action and Application for Proposed Pesticides (Bolded items are newly proposed)

Active Ingredients	Registered Use	Target Plants	Mode of Action	Method of Application
Aminopyralid (Milestone)	General Use Rangeland, grass pastures, non-cropland areas, natural areas	Broadleaf plants	Kills target species by mimicking plant growth hormone auxin (indole acetic acid) and, when administered at effective doses, causes uncontrolled and disorganized plant growth that leads to plant death	Spot treatment with hand-held sprayers or backpack sprayers; ground application
Clopyralid (Curtail, Stinger, Transline)	General Use Cropland, grass pastures, rangeland, and non-crop areas	Annual and perennial broadleaf herbs, especially knapweeds, thistles, and other members of the sunflower, legume, and knotweed families		Spot treatment with hand-held sprayers or backpack sprayers; ground application
Glyphosate (AquaMaster, Eagre, Glypro, Rodeo, Roundup)	General Use Forests and non-crop sites	Annual and perennial weeds and woody plants	Inhibits synthesis of aromatic amino acids necessary for protein formation in susceptible plants	Spot treatment with hand-held sprayers or backpack sprayers; ground application
Imazapyr (Plateau, Habitat)	General Use Pastures, rangeland, and non-crop areas	Annual and perennial broadleaves and grasses. Can be used as a pre- and post-emergent herbicide	Inhibits production of branched chain amino acids necessary for protein synthesis and cell growth	Spot treatment with hand-held sprayers or backpack sprayers; ground application
Triclopyr (Garlon 3A, Garlon 4, Pathfinder II, Tahoe 3A, Tahoe 4E, Renovate, Element 3A, Element 4)	General Use Non-crop areas	Woody plants, especially tamarisk, Russian olive and Siberian elm and annual and perennial broadleaf herbs	Kills target species by mimicking plant growth hormone auxin (indole acetic acid) and, when administered at effective doses, causes uncontrolled and disorganized plant growth that leads to plant death	Spot treatment with hand-held sprayers or backpack sprayers; ground application
Triclopyr + clopyralid (Redeem R&P)	General Use Rangeland and permanent grass pastures, non-crop areas	Annual and perennial broadleaf plants		Spot treatment with hand-held sprayers or backpack sprayers; ground application

Source: National Park Service, 2005

MONITORING AND RECORD KEEPING

Field crews will map all areas in which exotic plant species control occurs, record all pertinent information about control actions taken and gather additional site information. The GRCA Vegetation Program Manager will develop and implement monitoring procedures to determine control technique effectiveness. Monitoring of treatment areas will occur and data will be entered into the park's vegetation database. Herbicide records will be maintained on a daily basis; records will include herbicide amount used and area treated for each plant species.

In addition, treatment and removal results would be evaluated informally throughout the season and formally at the end of each season. Treatment strategies would be altered to reach objectives and goals described in Chapter 1 of the EA. New actions will include creating survey and treatment maps for year-end reporting, interpretive use and educational outreach; posting year-end reports on the park's website; and providing mapping data to the Southwest Exotic Plant Information Clearinghouse.

MITIGATION MEASURES

Mitigation measures listed below are considered part of the Preferred Alternative and will be followed during project implementation. These actions were developed to lessen potential for adverse impacts from implementing the Preferred Alternative, and have proven to be effective in reducing environmental impacts on previous projects.

Special Status Species To protect any unknown or undiscovered threatened, endangered, or special status species, any work implementation or contracts would include provisions for discovery of such. Provisions would require cessation of exotic plant management activities until park staff evaluated the impact, and would allow modifications to any contracts or work plans for any measures determined necessary to protect the discovery.

General Measures Relevant to All Listed Species

- To reduce noise, mechanized equipment will not be used any longer than is necessary, and no mechanized equipment will be used at night
- Efforts will be made to minimize number of trips and to reduce visibility, duration, and sounds of exotic plant management activities in proposed wilderness
- Crews will be informed of special status species locations
- Crews will practice low impact field techniques and leave no trace
- Herbicides with low toxicity that target the disruption of plant physiology and do not harm animals will be selected
- Herbicides will be applied directly to plants to minimize chance of herbicide drift
- Crews will ensure application will not take place on windy days and only small backpack-sized applicators will be used
- Applicators will have small nozzles to focus herbicide streams directly onto targeted exotic plant species
- Herbicides will be transported in leak-proof, spillproof containers and handled according to label specifications

- Fire treatments will be coordinated with GRCA Fire personnel to ensure proper techniques and safety measures
- Conservation measures developed in the 2002 Batch Biological Assessment (Lutch 2002) for the Parkwide Construction Program will be followed
- Prior to the start of any exotic plant management activities for the year, the GRCA Wildlife Program Manager or Horticulturalist will be contacted for any new information related to listed species or their status near the project area. Species location and survey maps will be updated annually with any new information to ensure consistency with the above measures and will be referenced when annual work plans are developed

Bald Eagle

- Exotic plant management surveys or treatments will not occur in the Nankoweap bald eagle wintering area when eagles are present. Bald eagles are generally present January through March, but could occur outside this timeframe as well
- If possible, exotic plant management surveys or treatments will not occur in vicinity of the Phantom Ranch bald eagle wintering area when eagle(s) are present. If this is not possible due to a high priority for treatment or need for field season access, the Park Wildlife Program Manager will be contacted for the latest information on roost locations in this area. If planned activities will be conducted with a small crew within the existing developed area and will not result in above-ambient noise or human-related disturbance, a determination will be made by the Wildlife Program Manager to allow activity on a case-by-case basis
- If new winter roosting areas or regularly-used foraging areas are identified in the park, they will be avoided when eagles are present
- Pesticide treatments will comply with the bald eagle protective measures of the Fish and Wildlife Service Region 2 Guidelines (White 2004). For the bald eagle, protective measure 45 is most applicable:
  - To protect bald eagles from secondary poisoning, Class 1_{sp}, 2_{sp}, and 3_{sp} herbicides in the Predatory Avian Toxicity Group will not be used in this project
  - Pesticides that rate Class 2 in this species toxicity group (i.e., Triclopyr ester) and are of liquid formulation will have a 20-foot buffer when applied by spot application at the edge of the water body or wetland

Brady Pincushion Cactus

- Exotic plant surveys or treatments will avoid occupied habitat near the GRCA—Marble Canyon boundary. Access through that area will remain on established roads only, and crews will be instructed in species identification so any off-road hiking to surveyor treatment sites will carefully avoid occupied habitat
- If any exotic plant management activities (surveys or treatments) are proposed in potentially suitable habitat for Brady pincushion cactus, surveys to locate the species will be conducted prior to implementation. If Brady pincushion cacti are found, exotic plant treatments will not be implemented until further consultation with the U.S. Fish and Wildlife Service (USFWS) is conducted.

- Chemical treatments will not be used in or near Brady pincushion cactus habitat. GRCA does not plan to treat exotic species above the rim where Brady pincushion cactus is found because it is in Bureau of Land Management (BLM) jurisdiction. Any GRCA chemical treatments will be conducted well below the rim

California Brown Pelican

- If brown pelicans are encountered by crews during travel to survey or treatment sites or during exotic plant management activities, crews will cease all activity until pelicans leave on their own accord

California Condor

- Prior to the start of specific actions, GRCA will contact personnel monitoring California condor locations and movement within GRCA to determine locations and status of condors in or near the proposed work area
- If a condor occurs at a surveyor treatment site, activities will cease until it leaves on its own or until permitted personnel employ techniques that result in the individual condor leaving the area
- Vegetation workers and supervisors will be instructed to avoid interaction with condors and to contact the appropriate GRCA or Peregrine Fund personnel immediately if and when condor(s) occur at a project site
- Any non-pesticide exotic plant management treatment activities within 0.25 miles of a confirmed nesting area will be restricted to the non-breeding season. Active nesting season is February 1 to October 15, or until young are fully fledged. Dates may be modified based on the most current information in consultation with the GRCA biologist and the U.S. Fish and Wildlife Service
- Any crew access necessary within 0.25 miles of an active nest during the breeding season (February 1 - October 15) will be limited to established roads and trails. If access off designated roads or trails or camping is necessary near an active nest site during the breeding season, only those activities that occur greater than 0.25 miles from any known or suspected nest area may be conducted. Such situations will be coordinated with the GRCA Wildlife Program Manager
- Pesticide treatments will comply with condor protective measures listed in the 2007 U.S. Fish and Wildlife Service Region 2 Guidelines (White 2007). For the condor, protective measures 17 and 46 are most applicable:
  - Development of conservation measures in consultation with the U.S. Fish and Wildlife Service is part of the proposed action
  - To protect California condors from secondary poisoning, Class 1_{sp}, 2_{sp}, and 3_{sp} herbicides in the Predatory Avian Toxicity Group will not be used in this project
  - Spot application of herbicide, except those that can cause secondary poisoning, will occur greater than 0.25 miles from any occupied nests, roosts or release sites
  - A non-persistent herbicide may be used near condor nests if the herbicide does not exceed Class 0 in the Predatory Avian toxicity group

Fickeisen Plains Cactus

- Exotic plant surveys or treatments will avoid occupied habitat near the GRCA—Marble Canyon boundary. Access through that area will remain on established roads only, and crews will be instructed in species identification so any off-road hiking to survey or treatments sites will carefully avoid occupied habitat
- If any exotic plant management activities (surveys or treatments) are proposed in potentially suitable habitat for Fickeisen plains cactus, surveys to locate the species will be conducted prior to implementation. If Fickeisen plains cacti are found, exotic plant treatments will not be implemented until further consultation with U.S. Fish and Wildlife Service is conducted
- Chemical treatments will not be used in or near Fickeisen plains cactus habitat. GRCA does not plan to treat exotic species above the rim where Fickeisen plains cactus is found because it is in BLM jurisdiction. Any chemical treatments by GRCA would be conducted well below the rim

Humpback Chub

- Only manual exotic plant treatment activities will occur adjacent to the Little Colorado River confluence where humpback chub spawn or Shinumo Creek where chub are being translocated. This measure will apply to future translocation sites and spawning locations as well
- No chemical or cultural treatments will occur adjacent to the Little Colorado River confluence or Shinumo Creek
- Any necessary treatments planned adjacent to the mainstem Colorado River will be carefully executed to ensure there is little, if any, input of material into the river system. Any woody slash created will not be put into the river
- Pesticide treatments will comply with the humpback chub protective measures listed in the 2007 USFWS Region 2 Guidelines. For the humpback chub, protective measures 13 and 27 are most applicable:
    - GRCA has identified critical habitat for humpback chub and will use this information to guide restrictions for exotic plant treatment activities
    - Aquatic pesticide formulations containing arcolein, antimycin A, copper chelate, copper sulfate, 2, 4-D, diquat, endothall, fluridone, glyphosphate, imazapyr, rotenone, simazine, or terbutryn, will not be used within 0.5 miles upstream from any suitable or occupied habitat area in any channel, tributary or spring run. Downstream of suitable or occupied habitat, these formulations will not be applied within 300 feet
    - No herbicides with a toxicity rating greater than 0 for fish will be used near the river or any perennial tributary. Buffers are not required for Class 0 species toxicity herbicides applied near the river or any perennial tributary
    - Liquid formulations of Class 1 species toxicity herbicides will require a minimum buffer of 10 feet when applied by spot application near the river or any perennial tributary
    - Liquid formulations of Class 2 species toxicity herbicides (i.e., Triclopyr ester) will require a minimum buffer of 20 feet when applied by spot application near the river or any perennial tributary

Kanab Ambersnail and Niobrara Snail

- Vaseys Paradise and Upper Elves Chasm populations will be avoided during all exotic plant treatment activities
- The Indian Garden Niobrara snail population will be avoided during all exotic plant treatment activities. Any necessary treatments or surveys planned adjacent to the population will be carefully conducted to ensure there is no trampling through the occupied spring site
- Any treatments in habitat of the Niobrara snail population will require additional consultation with USFWS
- Pesticide treatments will comply with the Kanab ambersnail protective measures listed in the 2007 USFWS Region 2 Guidelines. For the Kanab ambersnail, protective measure 24 is most applicable:
  - If liquid formulations of Class 0 or 1 species toxicity or food toxicity (i.e., water cress) herbicides are used at Indian Garden and applied by spot application, no buffer around occupied habitat is required
  - Liquid formulations of Class 2 species toxicity herbicides applied by spot application will adhere to a 10 foot buffer around occupied habitat

Mexican Spotted Owl (MSO)

- Treatments will be focused on exotic species only and will be designed to ensure key habitat components (as defined in the MSO Recovery Plan [USDI 1995]) of MSO habitat will not be altered
- Treatments will be designed to ensure that primary constituent elements (as defined in the final rule [USDI 2004]) of MSO critical habitat will not be altered
- All mechanized treatments will comply with conservation measures for the species of the Batch Biological Assessment
- Exotic plant management activities, including vegetation surveys and treatment activities, in designated Protected Action Centers (PACs) or within predicted habitat will be conducted outside the breeding season with the following possible exceptions
  - Vegetation surveys and manual treatments are allowed within designated PACs or predicted habitat, but limited to 10 people or less for no more than one hour during the breeding season (September I - February 28)
  - If camping is necessary in a designated PAC or within predicted habitat during the breeding season, it will occur greater than 0.25 miles from any known or suspected nest/roost/core area. Such situations will be coordinated with the GRCA Wildlife Program Manager
- MSO surveys will follow current survey protocol
- Pesticide treatments will comply with the 2007 USFWS Region 2 Guidelines. For MSO, protective measures 12, 13 and 49 are most applicable:
  - Pesticide use within critical habitat will be kept to a minimum
  - Control of invasive plant species along existing rights-of way inside MSO PACs, a non-persistent herbicide with a vegetable oil carrier will be used if the herbicide

does not exceed Class 0 in the Predatory Avian toxicity group. Applicators will ensure pesticide spray drift does not occur beyond the right-of-way
  - Spot applications of Class 0 or 1 herbicides in PACs, away from existing rights of-way, with a backpack sprayer or other hand-operated equipment will be applied outside MSO breeding season (March 1 - August 31)
  - To protect MSO prey species from secondary poisoning, Class 1_{sp}, 2_{sp}, and 3_{sp} herbicides in the Predatory Avian Toxicity Group will not be used in this project
  - Pesticides that rate as Class 0 or 1 in the Predatory Avian toxicity group applied outside the perimeter of a PAC or unsurveyed habitat during the breeding season will have an 80-foot buffer from the PAC or unsurveyed habitat boundary

Mohave Desert Tortoise

- Although pesticide treatments are not currently planned in desertscrub habitats in GRCA's western end, NPS staff will ensure that if herbicides are used in this habitat type, Mohave desert tortoise protective measures listed in USFWS Region 2 Guidelines (White 2004). For the Mohave desert tortoise, protective measure 54 is most applicable:
  - No burrow fumigants will be applied
  - No Class D (dicot specific), Class M (monocot specific), Class NS (non-specific) or any class higher than Class 0 in the reptile toxicity group will be applied within or adjacent to occupied habitat
- Additional consultation with USFWS may be necessary on site-specific plans to treat exotics plant species in Mohave desert tortoise habitat

Razorback Sucker

- Any necessary treatments planned adjacent to the mainstem Colorado River will be carefully executed to ensure there is little, if any, input of material into the river system. Any woody slash created will not be put into the river
- Pesticide treatments will comply with the razorback sucker protective measure listed in the 2007 USFWS Region 2 Guidelines. For the razorback sucker, protective measures 12, 13, and 27 are most applicable:
  - GRCA has identified critical habitat for razorback sucker and will use this information to guide restrictions for exotic plant treatment activities
  - Aquatic pesticide formulations containing arcolein, antimycin A, copper chelate, copper sulfate, 2, 4-D, diquat, endothall, fluridone, glyphosphate, imazapyr, rotenone, simazine, or terbutryn will not be used within 0.5 miles upstream from any suitable or occupied habitat area in any channel, tributary or spring run. Downstream of suitable or occupied habitat, these formulations will not be applied within 300 feet
  - Buffers are not required for Class 0 species toxicity herbicides applied near the river or any perennial tributary
  - Liquid formulations of Class 1 species toxicity herbicides will require a minimum buffer of 10 feet when applied by spot application near the river or any perennial tributary

- Liquid formulations of Class 2 species toxicity herbicides (i.e., Triclopyr ester) will require a minimum buffer of 20 feet when applied by spot application near the river or any perennial tributary

Relict Leopard Frog

- Exotic plant surveys and treatment activities will be designed and conducted to prevent any disturbance of occupied or suitable relict leopard frog habitat in Surprise Canyon
- Pesticide treatments will comply with the Chiricahuan leopard frog protective measures listed in USFWS Region 2 Guidelines (White 2004). For the relict leopard frog, protective measure 56 is most applicable:
  - Aquatic pesticide formulations containing arcolein, antimycin A, copper chelate, copper sulfate, 2, 4-D, diquat, endothall, fluridone, gyphosphate, imazapyr, rotenone, simazine, or terbutryn will not be used inside occupied or potentially occupied aquatic habitat
  - The following buffers should be applied at least 0.5 miles upstream from any suitable or occupied habitat area in any channel, tributary or spring run and at least 300 feet downstream of suitable or occupied habitat
    - Pesticides rated as Class 0 in the Aquatic Amphibian, Aquatic Arthropod and Terrestrial Arthropod toxicity groups may be applied on land below or above the high water line of species habitat. Applicators using these pesticides should make sure adverse effects for relict leopard frogs will not occur inside species habitat as a result of pesticide application
    - Aquatic glyphosate will not be applied within 100 feet of species habitat and will be mixed with water; no surfactants will be used including non-ionic nonylphenol polyethoxylate which has been shown to be toxic to larval leopard frogs
    - Liquid formulations of Class 1 species toxicity herbicides used near occupied habitat in Surprise Canyon or any other area where occupancy is suspected will be applied by spot application with a 30-foot buffer. Class 1 (or higher) chemicals in the in the aquatic amphibian toxicity group will not be used on land below the high water line of occupied or suitable habitat
    - Liquid formulations of Class 2 species toxicity herbicides, if used, would be applied by spot application with a buffer of 50 feet
- Park staff may determine tamarisk encroachment into relict leopard frog habitat is a problem and could be effectively treated to benefit leopard frog habitat. However, no treatments will occur in leopard frog habitat until further consultation is completed with USFWS to ensure adverse impacts are minimized and beneficial impacts maximized
- Proposed actions and conservation measures are consistent with the 2005 Conservation Agreement for relict leopard frogs

Sentry Milk Vetch

- Because exotic plants are a potential threat to sentry milk vetch, removal in occupied areas may be occasionally necessary to ensure continued habitat

suitability. Only manual removal (hand pulling) of priority exotic species will occur within occupied habitat at Maricopa Point, Grandview Point and Lollipop Point

- Crews will be small and instructed to avoid trampling sentry milk vetch individuals during work. All crew members will be approved by the GRCA Vegetation Program Manager to ensure they are trained in sentry milk vetch identification and avoidance
- Exotic species found in areas considered potential habitat (one location has been identified as of 2008 near Maricopa Point) will be treated using manual treatments only. Crews conducting manual treatments in unsurveyed potential habitat will be trained to recognize, avoid and report any sentry milk vetch encountered. No herbicides will be used in or near potential habitat (see buffers below)
- Although pesticide treatments are unlikely near sentry milk vetch habitat, NPS staff will ensure sentry milk vetch protective measures listed in the 2007 USFWS Region 2 Guidelines. For sentry milk vetch, protective measure 39 is most applicable:
  - No herbicides will be applied within 200 feet of occupied or unsurveyed sentry milk vetch suitable habitat. Outside that buffer, herbicides, if absolutely necessary, will be applied in liquid formulation by spot application
  - Broadcast spraying will occur along railroad tracks, approximately one mile from any known sentry milk vetch populations
  - No herbicides rated 2 or 3 in the pollinating insects toxicity group (bee and/or terrestrial arthropod) will be used in this project

Southwestern Willow Flycatcher

- Tamarisk treatments will only occur in tributaries of the Colorado River and at seeps and springs along the mainstem
- Tamarisk treatments will not occur in suitable or potential flycatcher habitat, or at sites of known southwestern willow flycatcher locations/records (nesting or other)
- Exotic plant species not considered components of flycatcher habitat (suitable and potential) may be treated either outside the breeding season or after protocol surveys (minimum five visits) indicate habitat is not currently occupied. Treatment of non-habitat components will not occur in occupied or unsurveyed habitat (suitable or potential)
- No camping or sustained activities will occur, except at river campsites, within occupied or unsurveyed flycatcher habitat (suitable or potential) unless outside breeding season
- Travel through (i.e., surveys for exotic plants) will not occur in occupied flycatcher habitat. However, travel may occur in unsurveyed flycatcher habitat in groups of five people or less. Travel will be planned to skirt dense vegetation and use openings to avoid potential habitat for flycatcher and limit any disturbance
- GRCA will use all of the recommendations of the Southwestern Willow Flycatcher Recovery Plan (USFWS 2002) and other related documents to initially determine whether a given patch of tamarisk may be flycatcher habitat. If any patches are questionable as to whether they are habitat, GRCA will take photographs and develop written descriptions of those areas. GRCA will then discuss the documentation of the questionable patches with USFWS. If the USFWS determines

a questionable patch is flycatcher habitat, then that patch will not be treated under this proposed action

- Habitat surveyors will be certified, have a broad background in identifying situational variety and quality of flycatcher nesting habitat, not only in GRCA, but at other locations as well
- Treatment of tamarisk will occur in tributaries of the Colorado River and at seeps and springs along the mainstem Colorado River if tamarisk sites are determined to not constitute suitable or potentially suitable flycatcher habitat and are not known nest sites or other known locations and site records
- GRCA will identify, monitor and report effects of tamarisk leaf beetles *(Diorhabda* spp.) should they occur in the park. Beetles will not be transported throughout the park should they be detected. Materials such as clothes, backpacks, coats, boats, shall be inspected to ensure beetles are not transported
- Pesticide treatments will comply with the flycatcher protective measures listed in the 2007 USFWS Region 2 Guidelines. For the southwestern willow flycatcher, protective measures 12 and 23 are most applicable:
  - No avian toxicant/deterrent herbicide treatments will be used
  - For areas adjacent to (but not within) occupied habitat, or species habitat that has not been surveyed, Class 0 or 1 (for small avian species) herbicides will be applied by spot application, cut stump or frill (hack and squirt) methods without a buffer to these areas
  - Class 2 herbicides are not proposed, but could be applied by spot application if absolutely necessary with a buffer of 10 feet from areas adjacent to (but not within) occupied habitat or unsurveyed habitat

Western Yellow-billed Cuckoo

- No exotic plant activities will occur near any known nesting sites or within potentially suitable habitat during the breeding season
- Habitat modification of native riparian areas will not occur as part of exotic plant management
- Following conservation measures for the southwestern willow flycatcher may also protect yellow-billed cuckoo habitat, although it is undetermined as to the amount of habitat overlap found between flycatchers and cuckoos
- Pesticide treatments will comply with the flycatcher protective measures listed in USFWS Region 2 Guidelines (White 2004). For the southwestern willow flycatcher, protective measures 12, 13, 14, and 23 are most applicable:
  - No avian toxicant/deterrent herbicide treatments will be used
  - For areas adjacent to (but not within) occupied habitat, or unsurveyed species habitat, Class 0 or 1 (for small avian species) herbicides will be applied by spot application, cut stump or frill (hack and squirt) methods without a buffer to these areas
  - Class 2 herbicides are not proposed, but could be applied by spot application if absolutely necessary with a buffer of 10 feet from areas adjacent to (but not within) occupied habitat or unsurveyed habitat

Yuma Clapper Rail

- No exotic plant treatments will occur in or around marshy or backwater areas, including areas where treatments could have indirect impacts on the Yuma clapper rail (i.e., upstream, adjacent to marsh) or its habitat. Sites include, but are not limited to, Burnt Springs and Spencer Canyons
- Any treatment of exotic plants would occur outside the breeding season in and around areas that could provide habitat for Yuma clapper rail
- Components of Yuma clapper rail habitat, including cattails and native marsh vegetation, will not be treated
  - Pesticide treatments will comply with the 2007 USFWS Region 2 Guidelines. For the Yuma clapper rail, protective measure 27 is most applicable:
  - Aquatic pesticide formulations containing arcolein, antimycin A, copper chelate, copper sulfate, 2, 4-D, diquat, endothall, fluridone, glyphosphate, imazapyr, rotenone, simazine, or terbutryn are proposed, will not be used within 0.5 miles upstream from any suitable or occupied habitat area in any channel, tributary or spring run. Downstream of suitable or occupied habitat, these formulations will not be applied within 300 feet
  - Class I pesticides, applied by spot application, in this species toxicity group will not be applied within 10 feet of occupied or suitable habitat

Soundscapes and Wilderness To minimize impacts on soundscapes and wilderness, the following mitigation measures would be incorporated into the action alternative

- To reduce noise, mechanized equipment would not be used any longer than necessary, and no mechanized equipment would be used at night
- Efforts would be made to minimize trip number and reduce IPM activities visibility, duration and sounds in proposed wilderness
- Additional minimum requirement analyses would be completed as needed to address equipment used, group size and access methods

Cultural Resources The park's General Management Plan Programmatic Agreement will be adhered to, and assessments of effect will be developed annually based on annual work plans. To minimize impacts on cultural resources, the following mitigation measures would be incorporated into the action alternative

- If previously unknown cultural resources are discovered during the project, a Cultural Resources specialist would be contacted immediately. All work in the immediate vicinity of the discovery would be halted until resources could be identified and documented and an appropriate mitigation strategy developed, if necessary, in accordance with stipulations of the 1995 Programmatic Agreement among the National Park Service, Arizona State Historic Preservation Officer, and Advisory Council on Historic Preservation regarding the General Management Plan/Environmental Impact Statement, Grand Canyon National Park, Arizona
- All workers would be informed of penalties of illegally collecting artifacts or intentionally damaging any cultural property. Workers would also be informed of correct procedures if previously unknown resources were uncovered during construction activities

- Areas selected for equipment and materials staging in developed areas are expected to be in existing disturbed areas or existing paved overlooks where there is no potential for cultural resources disturbance. If sites selected for these activities change during later design phases for implementation of any of the alternatives, additional surveys would be conducted
- Vegetation Program Crew Leaders would attend one-day training in recognition of archaeological sites and associated sensitivities in field work conditions. This training will be provided by GRCA Cultural Resources staff and include methods for planning ahead and preparing field crews for work around archaeological sites, identification of historic and prehistoric artifacts and features and avoiding site disturbances
- Annual work plans would be reviewed by GRCA Cultural Resources staff to evaluate project areas, crew size and invasive vegetation treatment types and associated ground disturbing activities
- Cultural Resources staff would provide maps to Vegetation Program Crew Leaders showing location of archaeological sites in relation to vegetation treatment areas. Maps showing location of archaeological sites would be returned at the end of the project
- In areas proposed for invasive plant treatment where archaeological inventory survey has not been completed, an archeologist or other specialist would need to review mechanical subsurface treatment of plants prior to implementation. Mechanical subsurface treatment includes any ground disturbance greater than 6 inches deep and 12 inches in diameter
- An archeologist would review mechanical subsurface treatment (digging) in sensitive areas of known archaeological sites (constructed features, middens, artifact concentrations) prior to implementation. All such activities would be documented and filed with site records. Loosening soil with hand tools while hand-pulling herbaceous plants and shrubs is allowable, provided ground disturbance would not exceed 6 inches deep and 12 inches in diameter, and soil would not be removed from the treatment area
- Accessing work /treatment areas should be planned to avoid walking through archaeological sites whenever possible
- Work crews would be split into small teams of two to four people when working around archaeological sites
- Work crews would not walk across archaeological features such as constructed features, middens or artifact concentrations
- Work crews would avoid creating paths and trails in loose soils and sand
- Work crews would avoid walking on bedrock surfaces that contain artifact concentrations to avoid crushing artifacts
- Work crews would report all previously unrecorded archaeological sites using GRCA's Site Discovery form
- All inadvertent damage to archaeological sites would be documented by recording GPS coordinates, map location, photographs and description of damage

- If vegetation removal or herbicide use were anticipated at historic wall foundations or mortar joints, the park's Historical Architect would be consulted prior to treatment to avoid any adverse impacts to these resources

Visitor Experience The following mitigation measures would be incorporated into the action alternative to minimize impacts on visitor experience

- Unless otherwise approved by the park, operation of mechanized equipment would be restricted to dawn to dusk, year-round
- As time and funding allow, information regarding project implementation and other foreseeable future projects would be shared with the public through park publications (such as *The Guide*) and other appropriate means during construction periods. This may be an informational brochure or flyer distributed at the gate and sent to those with reservations at park facilities, postings on the park website, press releases and/or other methods. The purpose would be to minimize potential for negative impacts to visitor experience during project implementation and other planned projects during the same construction season

Air Quality Air quality impacts of the action alternative are expected to be temporary and localized. To minimize Impacts, the following actions would be taken

- To reduce tailpipe emissions, equipment and vehicles used for exotic plant management would not be left idling any longer than necessary for safety and mechanical reasons
- To reduce re-entrained road dust, all vehicles will observe posted speed limits and travel at low speed on unpaved roads

Best Management Practices

- Primary field crew leaders, concessionaires and other NPS employees would be required to attain Arizona pesticide certification. Although all currently used and proposed herbicides do not require such certification, this is an extra measure to ensure safety for employees and visitors
- Workers without pesticide certification would be able to apply non-restricted use herbicide under supervision of a certified field crew leader
- Vegetation Program Managers will prepare a safety plan and job hazard analyses (JHAs) for all exotic plant management activities prior to project implementation
- Vegetation Program Managers will ensure all NPS and GRCA rules, regulations and standard operating procedures (SOP) are followed
- Vegetation staff will post signs in pedestrian and high use areas when herbicide is being applied
- Other precautions for reducing and eliminating risk to humans during exotic plant activities include posting notice of activity in high use areas or timing technique (when possible) during low visitor use to the area (both time of day and of year)
- Crews would be informed of special status species locations including Mexican spotted owl PACs, and California condor and southwestern willow flycatcher nests
- Crews would practice low impact field techniques and leave no trace methods

- Herbicides with low toxicity that target disruption of plant physiology and do not harm animals would be selected
- Herbicides would be applied directly to plants to minimize herbicide drift
- Crews would need to ensure application would not take place on windy days, and only small backpack-sized applicators would be used
- Applicators would have small nozzles to focus herbicide streams directly onto targeted exotic plant species
- Herbicides would be transported in leak-proof, spill proof containers and handled and disposed according to label specifications and park policies
- Fire treatments would be coordinated with GRCA Fire personnel to ensure proper techniques and safety measures
- Crews would refrain from interactions with bighorn sheep and haze individuals that approach camp sites
- Crews would avoid camping near snags or live damaged trees to avoid disturbance to special status wildlife, including bats

ALTERNATIVES CONSIDERED

The EA evaluated a No Action Alternative and one Action Alternative for addressing the purpose and need for action. The Preferred Alternative was identified as Alternative 2, and is as described previously in this FONSI in detail.

Alternative 1 No Action Alternative

Under the No Action Alternative, current management practices would be used to control exotic plant species throughout Grand Canyon National Park. Current management practices include limited integrated pest management techniques; species prioritization using APRS; completion of annual work plans; education; collaboration; early detection and prevention; cultural, manual, mechanical and chemical treatments; and monitoring and record keeping. The No Action Alternative is a "continue current management" alternative. While this alternative would address some exotic plant management, it does not meet the purpose and need for action. This alternative was not the selected alternative for this project.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

The environmentally Preferred Alternative is determined by applying criteria suggested in the National Environmental Policy Act of 1969 which guides the Council on Environmental Quality (CEQ). CEQ provides direction that "[t]he environmentally preferable alternative is the alternative that will promote the national environmental policy as expressed in NEPA Section 101" including

1. Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
2. Assure for all generations safe, healthful, productive, and aesthetically and culturally pleasing surroundings;
3. Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;

4. Preserve important historic, cultural and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice;
5. Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and
6. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

Through the process of internal and public scoping, the environmentally Preferred Alternative selected is the Preferred Alternative (Alternative 2). Alternative 2 best meets the purpose and need for action and best addresses overall park service objectives and evaluation factors while minimizing impacts to park resources. Alternative 2 promotes active control of exotic plant species throughout the park and would enhance the native landscape, assure pleasing surroundings, allow attainment of the widest beneficial uses of the environment and preserve cultural and natural aspects of our national heritage. Alternative 1 would result in inadequate control and prevention thereby jeopardizing the quality of the park's natural and cultural resources and visitor experience. Alternative 2 best achieves the balance between resource use and visitor experience, as specifically identified in numbers 3 and 4 above, while also minimizing new resource impacts as identified in numbers 2, 4 and 5 above.

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 following criteria:

Impacts that may be both beneficial and adverse As fully discussed in the EA, the Preferred Alternative will not measurably affect soundscapes, environmental justice, prime and unique farmland, socioeconomic environment or Indian trust resources.

Preferred Alternative implementation will result in moderate beneficial long-term impacts to native vegetation including reduced competition with exotic plants. Adverse impacts to native vegetation including trampling and inadvertent vegetation damage during exotic plant treatment will be localized short term minor.

Preferred Alternative implementation will result in minor long-term seasonal to year-round beneficial impacts to general wildlife including native plant habitat restoration for shelter and associated food sources. Adverse impacts including noise disturbance, habitat modification and effects of chemical control will be localized short term minor based on use of best management practices and mitigation measure implementation.

Implementation of the Preferred Alternative will result in minor long-term beneficial impacts to special status species including restoration of native plant habitat for shelter and associated food sources. Adverse impacts including noise disturbance, habitat modification and potential direct effects of herbicide use will be localized short to long term minor.

Implementation of the Preferred Alternative will result in minor, localized, long-term adverse impacts to soil resources due to trampling, resultant erosion, and damage to biological soil crusts Beneficial impacts including increased water retention from mulch and plant material left onsite will be local, long term, and minor.

Preferred Alternative implementation will result in moderate local short- to long-term seasonal to year-round beneficial impact to water and aquatic resources due to increased water flow and velocity following exotic plant removal. Adverse impacts including increased turbidity, erosion, soil-stabilizing plant loss and changes to water quality parameters will be local short to long term seasonal to year round minor.

Preferred Alternative implementation will result in minor adverse localized short term impacts to air quality due to vehicle use, dust generated from exotic plant management activities and use of fire to treat exotic plants.

Preferred Alternative implementation will result in minor short- to long-term adverse impacts to archaeological and historic resources due to increased erosion and soil compaction. Beneficial impacts including soil protection and stabilization from vegetative material left onsite will be short to long term minor.

Preferred Alternative implementation will result in minor long-term beneficial impacts to cultural landscapes due to native plant restoration and removal of nonnative plants that are not key features in the landscape. Adverse impacts including changes to vegetation will be negligible short to long term.

Preferred Alternative implementation will result in minor short- to long-term beneficial impacts to ethnographic resources due to soil protection and stabilization from vegetative material left onsite. Adverse impacts from increased erosion and soil compaction will be short to long term minor.

Preferred Alternative implementation will result in local long-term minor beneficial impacts to visitor experience due to overall native ecosystem restoration and increased education efforts. Adverse impacts from presence of crews, specifically in the backcountry; use of mechanized equipment and chemicals to treat exotic plants; and visibility of smoke from fire treatments will be local short to long term minor.

Preferred Alternative implementation will result in minor short- to long-term adverse impacts to wilderness character due to presence and visibility of crews, and decreased visibility from smoke. Beneficial impacts including overall actions to restore native ecosystems will be long term minor.

Preferred Alternative implementation will result in minor localized short- to long-term adverse impacts to public health and safety due to use of hand tools, mechanized equipment, chemicals and fire.

Preferred Alternative implementation will result in minor short- to long-term impacts to park operations due to time and money needed to treat exotic plant species. Beneficial impacts including use of the most effective and efficient methods to treat exotic plant species will be short to long term minor.

Degree of effect on public health or safety Use of hand tools, mechanized equipment, chemicals and fire have an inherent element of concern for public health and safety. The EA identified effects would be minor localized short to long term. Adherence to mitigation measures designed to minimize safety risks and adverse impacts to visitors during exotic plant treatment will address these limited 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 The Preferred Alternative will not measurably affect soundscapes, environmental justice, prime and unique farmland, socioeconomic environment or Indian trust resources. No wild and scenic rivers are designated in the park and none will be affected by Preferred Alternative implementation. No ecologically critical areas are known within the priority project areas. Mitigation measures minimize potential for adverse impacts to natural and cultural resources.

Degree to which effects on the quality of the human environment are likely to be highly controversial There were no highly controversial effects identified during either EA preparation or the public review period.

Degree to which possible effects on the quality of the human environment are highly uncertain or involve unique or unknown risks There were no highly uncertain, unique or unknown risks identified in the EA or during the public review.

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 Preferred Alternative neither establishes a precedent for future actions with significant effect 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 Preferred Alternative implementation will not result in any significant cumulative impacts.

Degree to which the action may adversely affect districts, sites, highways, structures or objects listed on National Register of Historic Places or may cause loss or destruction of significant scientific, cultural or historical resources Cultural resources, including archeological, historic, and ethnographic resources, and cultural landscapes, have potential to be affected by the proposed actions. All Preferred Alternative components take into consideration potential for impacts to these sensitive cultural resources, and annual work plant will ensure protection of these resources.

NPS initiated consultation with the State Historic Preservation Officer (SHPO), and requested comments on preliminary alternatives under consideration and input on the framework for consultation under Section 106 of NHPA in March 2005, in a letter distributed during the first public scoping period. In response, SHPO sent a letter dated April 18, 2005 stating the office would look forward to the agency's §106 consultation for this undertaking. NPS sent a letter in January 2008 to initiate consultation and inform the SHPO of the NPS decision to complete a combined EA and Assessment of Effect (AEF) to fulfill §106 consultation. Through several conversations in person and by e-mail, SHPO and the park agreed use of the Programmatic Agreement developed for the General Management Plan would be appropriate for this plan. In addition, the park will submit annual assessments of effect based on proposed exotic plant management activities each year. AEFs will be reviewed by the SHPO. On March 31, 2009 NPS received a concurrence letter from the SHPO on the finding of No Adverse effect for the Exotic Plant Management Plan.

NPS initiated consultation with all affiliated American Indian tribes and requested comments on several preliminary alternatives in March 2005 in a letter distributed during the first public scoping period. No comments were received from the tribes in response to this letter. During a tribal consultation meeting with the Havasupai Tribe in February 2007, the tribe expressed concern with eradication of edible and medicinal plants and added that all plants need consideration and respect. The tribe also commented on the scope of project and asked how the park would complete proposed work. During a tribal consultation meeting with the Hualapai Tribe in March 2007, the tribe expressed interest in collecting native plants in the park, and requested a meeting with vegetation staff to exchange ideas on dealing with invasive and toxic plants. At a pan tribal meeting in July 2007, no comments were received. In September 2007, the park sent a letter to all affiliated tribes to inform them of the NPS decision to complete a combined EA/AEF to fulfil §106 consultation. A copy of the EA/AEF was distributed to all affiliated tribes for review and comment.

Degree to which the action may adversely affect an endangered or threatened species or its critical habitat For purposes of Section 7 consultation under the Endangered Species Act, Preferred Alternative implementation may affect, but is not likely to adversely affect, California condor, Mexican spotted owl and its critical habitat, southwestern willow flycatcher, Yuma clapper rail, humpback chub and its critical habitat, razorback sucker and its critical habitat, Kanab ambersnail, Brady pincushion cactus and sentry milk vetch. In addition, the Preferred Alternative will not affect the brown pelican or Mohave desert tortoise. Concurrence on these determinations was received from the U.S. Fish and Wildlife Service on June 29, 2009.

Whether the action threatens a violation of Federal, state or local environmental protection law The Preferred Alternative violates no Federal, state or local environmental protection laws.

APPROPRIATE USE, UNACCEPTABLE IMPACTS AND IMPAIRMENT

Sections 1.5 and 8.12 of *NPS Management Policies* emphasize that not all uses are allowable or appropriate in units of the national park system. The proposed use was screened to determine consistency with applicable laws, executive orders, regulations and policies; consistency with existing plans for public use and resource management; actual and potential effects to park resources; and whether the public interest would be served. Treatment of exotic plant species as a whole is not inconsistent with any laws, executive order, regulations, policies or plans, in fact the purpose of GRCA's 1995 General Management Plan specifically is to provide a foundation from which to protect park resources while providing meaningful visitor experiences. The proposed project area spans the entire park and includes all designated management zones including natural, cultural and development zones. This proposal tiers from the GMP, and further refines direction for management of invasive plant species throughout the park. This project will have some impact to park resources; actual and potential impacts are described in the EA. However, the park service finds that the Preferred Alternative is an appropriate use. Because the analysis determined that no major adverse impacts would occur, and mitigation measures would further lessen impacts, Preferred Alternative implementation would not result in any unacceptable impacts. The EA includes criteria used to evaluate unacceptable impacts and a subsequent discussion specific to this project.

In analyzing impairments in the NEPA analysis for this project, the NPS takes into account that if an impairment were likely to occur, such impacts would be considered major or significant under CEQ regulations. This is because impact context and intensity would be sufficient to render what would normally be a minor or moderate impact to be major or significant. Taking this into consideration, NPS guidance documents note "Not all major or significant impacts under NEPA analysis are impairments. However, all impairments to NPS resources and values would constitute a major or significant impact under NEPA. If an impact results in impairment, the action should be modified to lessen the impact level. If the impairment cannot be avoided by modifying the proposed action, that action cannot be selected for implementation (*Interim Technical Guidance on Assessing Impacts and Impairment to Natural Resources*, National Park Service, Natural Resource Program Center, July 2003).

In addition to reviewing the definition of "significantly" under NEPA regulations, the NPS determined Preferred Alternative implementation would not constitute an impairment to the integrity of Grand Canyon National Park's resources or values as described by *NPS Management Policies* (NPS 2006 § 1.4). This conclusion is based on NPS analysis of the proposed action's environmental impacts as described in the EA. The EA identified less than major adverse impacts on native vegetation, general wildlife, special status species, soil resources, water and aquatic resources, air quality, archaeological and historic resources, cultural landscapes, ethnographic resources, visitor experience, wilderness character, public health and safety and park operations. This conclusion is further based on the Superintendent's professional judgment, as guided and informed by the park's General Management Plan. Although the project has some negative impacts, in all cases these adverse impacts are the result of actions taken to preserve and restore other park resources

and values. Overall, the project results in benefits to park resources and values, opportunities for their enjoyment and does not result in their impairment.

PUBLIC INVOLVEMENT

The EA was made available for public review and comment during a 30-day period ending March 27, 2009 through a combination of direct mailing, issuance of a press release and posting on the Planning, Environment and Public Comment (PEPC) website (http://parkplanning.nps.gov/grca). All those that previously provided comments during the public scoping periods received either a printed copy or a letter notifying them the EA was available for public review.

Three comments were received during public review of the EA. These responses include two letters from state agencies (Arizona Department of Environmental Quality and Arizona Game and Fish Department), and one from a conservation organization. Overall, these comments support the treatment of exotic plants using integrated pest management techniques. Concerns about cheatgrass burning, monitoring and recordkeeping and water quality were also expressed and are addressed in the errata sheet of this FONSI.

CONCLUSION

The Preferred Alternative does not constitute an action that normally requires preparation of an environmental impact statement (EIS). Negative environmental impacts that could occur are negligible to moderate in effect. There are no unmitigated adverse impacts on public health, public safety, threatened or endangered species, sites or districts listed on or eligible for listing in the National Register of Historic Places, known ethnographic resources or other unique characteristics of the region. No highly uncertain or controversial impacts, unique or unknown risks, 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, it has been determined the project does not constitute a major Federal action significantly affecting the quality of the human environment, and an EIS will not be required for this project and thus will not be prepared.

Recommended: _____ 7/13/09

Steve Martin
Superintendent, Grand Canyon National Park

Date

Approved: _____ 7/16/09

Michael D. Snyder
Director, Intermountain Region

Date

ERRATA SHEETS
Exotic Plant Management Plan
Grand Canyon National Park

The NPS received a total of three public responses during review of the Exotic Plant Management Plan EA (February 2009). An interdisciplinary team reviewed these responses to identify any substantive comments. Substantive comments were considered to be comments which

- question, with reasonable basis, the accuracy of information in the EA
- question, with reasonable basis, the adequacy of environmental analysis
- present reasonable alternatives other than those presented in the EA
- cause changes or revisions in the proposal

Substantive comments to the Exotic Plant Management Plan Environmental Assessment that are addressed below resulted in minor changes to the text of the environmental assessment.

TEXT CHANGES

Change Coordination with GRCA Fire Activities section on page 29 of the EA to read:

Coordination with GRCA Fire Activities

Fire has potential to introduce and spread exotic plant species. Fire timing and plant lifecycles are important variables in exotic species establishment. Alternative 2 proposes that the Vegetation Program work with GRCA Fire Program to prevent and/or manage invasive exotic plant populations efficiently and effectively. Where implementation of these programs overlap, staff will track dates and dual treatment prescriptions (i.e., hand pull and prescribed burn) and map locations. Other efforts include

- Provide invasive plant awareness and prevention training and educational materials to GRCA Fire Program staff and Resource Advisors. Resource Advisors would be responsible for presenting information to the Incident Management Team when wildfire or control operations occur in or near a noxious weed area, and to Burn Rehabilitation Teams when applicable
- Provide exotic plant spatial data to Fire Program semi-annually to inform the management of planned and unplanned fires
- Clean fire vehicles, equipment and clothing in compliance with parkwide policy
- Locate control lines, helispots, fire camps, and other soil disturbing fire management activities to minimize introduction and spread of exotic plant species
- Inspect helispots, staging areas, incident command posts/base camps, etc., periodically and minimize exotic species introduction
- Use Minimum Impact Suppression Techniques to reduce disturbances to soil and vegetation
- As fire crews conduct pre-burn assessments and install Fire Effects monitoring plots, they will gather invasive plant species information, assess potential risks, and share data with the Vegetation Program

- Rehabilitate affected sites (i.e. control lines, staging areas, and helispots) as soon as possible following disturbance. Develop BAER plans as appropriate.
- Procure certified weed-seed free mulching materials and native plant seed used in fire rehabilitation

SUBSTANTIVE COMMENTS

Comment Water quality in the Colorado River is altered by selenium from Lake Powell to the Paria River and by suspended sediment and selenium between Parashant Canyon and Diamond Creek.

Response The affected environment for Water and Aquatic Resources in the EA has been expanded to include this information in italics:

Water quality in GRCA is generally considered to be good in most areas (i.e., below state and Federal standards) though localized exceedances in arsenic, selenium, nutrients, radionuclides and seasonal, brief exceedances of turbidity do occur. *For example, water quality is altered by suspended sediment and selenium between Parashant Canyon and Diamond Creek which is listed as impaired in the 2006-2008 Status of Ambient Surface Water Quality in Arizona – Arizona's Integrated 305(b) Assessment and 303(d) Listing Report* (ADEQ 2008).

Comment It is important that manual and chemical removal of plants do not contribute to sediment loading in the Colorado River.

Response The EA contains mitigation measures in Chapter 2 addressing chemicals use near the Colorado River, and limit addition of woody materials. These measures would minimize sediment loading. In addition, GRCA is not proposing tamarisk removal along the river or other species removal that would measurably add to erosion. In side canyons removal of tamarisk seedlings will occur, but saplings and larger tamarisk trees will be cut and treated with herbicide or girdled which will lessen erosion in these areas. For these reasons, no changes were made to the EA in response to this comment.

Comment Reconsider cheatgrass as a low priority species within the Environmental Analysis of the Exotic Plant Management Plan.

Response GRCA uses the Alien Plant Ranking System (APRS) as the primary means to prioritize exotic species (see alternative descriptions in EA). Those species with the most impact, are most invasive, and are feasible to control rank highest. Cheatgrass ranks low using the APRS because it is not feasible to control parkwide. As discussed in Chapter 2 of the EA under the Preferred Alternative, the priority of cheatgrass may change when looked at on a smaller scale (i.e., burn unit). GRCA will consider t cheatgrass treatment on a case-by-case basis. The park will consider funding, treatment methods and associated environmental impacts in these decisions.

Comment Carefully consider burning in areas with well established cheatgrass.

Response Exotic plants will be considered in both planned and unplanned fires (see Coordination with GRCA Fire Activities above). Areas with established exotic plant species will be considered prior to burning.

Comment Only metal-barrel burning should be considered because pile burning has potential to sterilize soil, eliminate mycorrhizae and allow reinvasion of weeds. I recommend burning over snow in the winter to address these concerns.

Response GRCA plans to use fire as an exotic plant treatment primarily along the river and generally not in forested areas. Metal barrels and small pile burning would be used. Piles would be burned on wet sand to minimize heat damage to the soil.

Comment No burning of cheatgreass co-located with populations of camelthorn and bindweed should occur.

Response In general, cheatgrass is not co-located with camelthorn which is found primarily along the Colorado River; however, consideration would be taken when burning in any areas with exotic plant species.

Comment Monitoring and record keeping sections of the EA are very general. Development of a detailed monitoring plan is encouraged to determine whether treatments are effective.

Response GRCA completes annual work plans that identify more specific information on inventories, monitoring methods and early detection. As a framework for exotic plant management used for 10 years, the EA purposefully did not include this specific information as it is expected monitoring and record keeping will change annually.

Comment Provide more information on early detection and prevention, including inventories, monitoring and specific early detection/warning system for new invasions (i.e., identifying ways for the public and local residents to provide information on exotic plant invasions).

Response GRCA agrees involving the public and local residents in early detection is important. Currently, the park uses two site bulletins and three pamphlets to educate park visitors, employees and residents about exotic plant species, and provides postcards that can be mailed to the park with exotic plant sightings and locations. Park staff also offer hands-on learning opportunities and public presentations year-round.

Comment More information on low impact techniques is requested. What species will these techniques be used on and is there documentation on effectiveness?

Response Use of low impact control methods such as hot water (steam), biodegradable soap and soil amendments could be of interest to the park, especially for use in sensitive areas where ground disturbance is not acceptable, such as cultural resource sites.

Nonnative plant control using hot water or steam is an emerging technique with the mechanical delivery systems still under development and innovation. Current information suggests the technique is most effective on annuals and young perennials.

Other methods that alter local environmental conditions could help maintain an area after initial control treatments or assist in preventing infestations in restoration sites. As an example, sugar addition to soil reduces soil nitrate levels which can allow native plants to outcompete nonnative plants, especially annual nonnatives.

Comment We recommend that when the NPS collaborates with other land management agencies you discuss minimizing trespass cattle grazing and request that lands directly adjacent to the park not be included in grazing allotments.

Response GRCA routinely reviews and comments on grazing plans from adjacent land managers. In addition, the park does have a boundary fence that is surveyed and repaired cyclically to help minimize trespass cattle and bison in the park.

Comment Climate change has potential to impact park native and exotic plant species. The NPS could identify ways in which vegetation patterns might be altered, identify plants that would thrive under drier, hotter conditions, the species that can take advantage of increased levels of CO2 would be particularly problematic. Would this information change the priority areas and priority species?

Response Climate change was considered in preparation of the EA, but was not specifically included in the document primarily because future impacts on native and exotic plant species are uncertain. The Preferred Alternative includes expansion of IPM techniques to include those available both now and in the future for proactive, adaptive and responsible integrated exotic plant management. GRCA will adapt to exotic plant management needs prompted by climate change.

In addition, the NPS is considering reduction of unnatural stress to address climate change and keep ecosystems resilient. Exotic plant competition is considered one type of stress.

Priority areas and priority species may change based on changes in climate. The EA was written as a framework with flexibility to shift priorities as needed over the next 10 years. Based on current literature, it is uncertain what will happen with each exotic plant species. Some exotic plant species may shift in range while other populations will expand or contract. Again, adaptive management will be used to address necessary changes in managing exotic plant species.

REFERENCES

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