

Integrated Pest Management Plan Environmental Assessment

National Park Service
U.S. Department of the Interior

Casa Grande Ruins National
Monument



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Integrated Pest Management

Environmental Assessment

Administrative Summary

Throughout the history of the National Park Service, maintaining the balance between resource protection and visitor safety, pest management has been an ongoing challenge. Overpopulations of insects, rodents and non-native birds create public health hazards within various buildings and sites at Casa Grande Ruins National Monument (CAGR); some have tested positive for infectious diseases. Animals living within prehistoric walls and burrowing through prehistoric floors have damaged irreplaceable archeological features. Pest management must be addressed as a structured, interdisciplinary approach in order to be effective for the long-term preservation and protection of natural and cultural resources so that future generations may enjoy them.

CAGR was designated to protect prehistoric cultural resources, but it also contains diverse plant and animal communities that can be disturbed and displaced by overpopulations of pest species. Treatment of invasive plants has already been addressed in the Integrated Environmental Assessment & Invasive Plant Management Plan of December 2007 which was also the format used for this document. The primary focus of this Environmental Assessment (EA) would be the integrated management of vertebrate and invertebrate pest species. This EA would provide a plan that can be referenced in the future and used to implement the management practices previously decided upon. A plan is needed to guide CAGR managers in containing, suppressing, or eradicating invasive vertebrate and invertebrate pest populations at Casa Grande Ruins National Monument to prevent the accelerated deterioration of sensitive resources or risk to human health and safety caused by pest species. This EA outlines management strategies that are based on the principles of Integrated Pest Management (IPM) and use the following control techniques: mechanical, cultural, chemical, and biological techniques or any combination of them.

This EA evaluates two alternatives: Alternative I: Current Management and Alternative II: Preferred Alternative. Alternative I describes the current management strategy of using a limited scope of treatments. The second alternative would use a full range of integrated pest management techniques.

This EA has been prepared in compliance with the National Environmental Policy Act (NEPA) to provide the decision-making framework that 1) analyzes a reasonable range of alternatives to meet objectives of the proposal, 2) evaluates potential issues and impacts to the resources and values of Casa Grande Ruins National Monument, and 3) identifies mitigation measures to lessen the degree or extent of these impacts. The following resource topics are analyzed in this document: Soils, Archeological Resources, Special Status Species/Wildlife, Human Health and Safety, and Museum Collections. All other resource topics have been dismissed because neither alternative would pose more than a negligible or minor impact to those resources. No major effects are anticipated as a result of this project and no public comments were received during the initial scoping period.

This IPM program and EA define pests as animals whose activities pose a threat to human health and safety, or pose a threat to resource conservation. This definition includes individuals within both native and non-native species. It also includes animals whose natural balances have been disrupted resulting in overpopulations that pose a threat to resource protection. Such population increases are usually attributed to degradation of surrounding lands, urban encroachment, improvement of habitat within the monument, and a loss of predator species that previously would have helped keep pest populations in balance.

Considerable benefits are gained by structuring and implementing an effective IPM program at CAGR. In order to be effective, IPM plans must be periodically reviewed and updated in response to new monitoring data or technology, to address the successes and deficiencies of previous plans, and to

address changes in human use of buildings and landscapes. Implementation of a low-risk IPM approach includes excluding pests from entering structures, eliminating pests that may already be present, maintaining a monitoring program to determine the extent of pest activities, implementing management procedures prior to pest population buildup, and minimizing the use of pesticides in both developed and natural zones.

Public Comment

If you wish to comment on this EA, you may post comments online at <http://parkplanning.nps.gov/> or mail comments to the attention of Karl Cordova, Casa Grande Ruins National Monument, 1100 Ruins Drive, Coolidge, Arizona 85128. This EA will be on public review for 30 days. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we would be able to do so. All submissions made by individuals identifying themselves as representatives of organizations or businesses would be made available for public inspection in their entirety.

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INTRODUCTION

Integrated Pest Management (IPM)

The habits and behaviors of some vertebrate and invertebrate pests pose a threat to cultural resources, natural resources, and historic buildings. They also pose potential risks to human health and safety at CAGR. The Monument proposes to use a variety of integrated pest management treatments to control these species, reduce risks to health and safety, reduce damage to the resources, and enhance the visitor experience through continued protection of both natural and cultural resources.

"IPM is a science based decision-making process that combines the knowledge of pest biology and the environment where the pest is occurring in order to coordinate an effective pest management strategy with the least risk to people, resources, and the environment. It is a systematic approach that focuses on solving the underlying problems in order to address pest issues for the long-term rather than repeatedly addressing the pest or symptoms on a short-term or "quick fix" basis. The IPM approach includes changing the immediate site conditions and modifying associated human behavior through education and concurrence of the site manager or superintendent. By using a site specific, interdisciplinary approach to pest management, IPM is able to prevent unacceptable levels of pest damage in a way that balances costs, benefits, public health, and environmental quality." (*Mattor & Koziol, 2006*)

The purpose of this EA is to evaluate and ensure implementation of IPM procedures at the Monument. This EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, regulations of the Council on Environmental Quality (CEQ) (40 CFR 1508.9), and the National Park Service (NPS) Director's Order (DO)-12 (*Conservation Planning, Environmental Impact Analysis, and Decision-making*).

Impairment:

NPS's *Management Policies* (2006) require analysis of potential effects to determine whether or not actions would impair monument resources (NPS 2006). The fundamental purpose of the national park system, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting monument resources and values. However, the laws do give NPS the management discretion to allow certain impacts to monument resources and values, when necessary and appropriate, for daily management.

Although Congress has given NPS the management discretion to allow certain impacts within monuments, that discretion is limited by the statutory requirement that NPS must leave monument resources and values unimpaired unless a particular law directly and specifically provides otherwise. Prohibited impairments are impacts that, in the professional judgment of the responsible NPS manager, would harm the integrity of monument resources or values. While any impact to any monument resource or value may constitute impairment, an impact would be more likely to constitute impairment to the extent that it has a major or severe adverse effect upon a resource or value when the conservation of that resource is:

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

Two feasible alternatives have been outlined within this document: *Alternative I: Current Management*, and *Alternative II: Preferred Alternative*. Ten additional alternatives were considered and dismissed,

including *Do Not Conduct any Pest Management at CAGR* which was dismissed because it risks potential impairment to CAGR resources. Each alternative is the result of research, monitoring, limited testing, and discussions over a five year period. The following alternatives cover a range of what is physically possible, acceptable by policy, and feasible for on-site resource management; i.e. all reasonable alternatives.

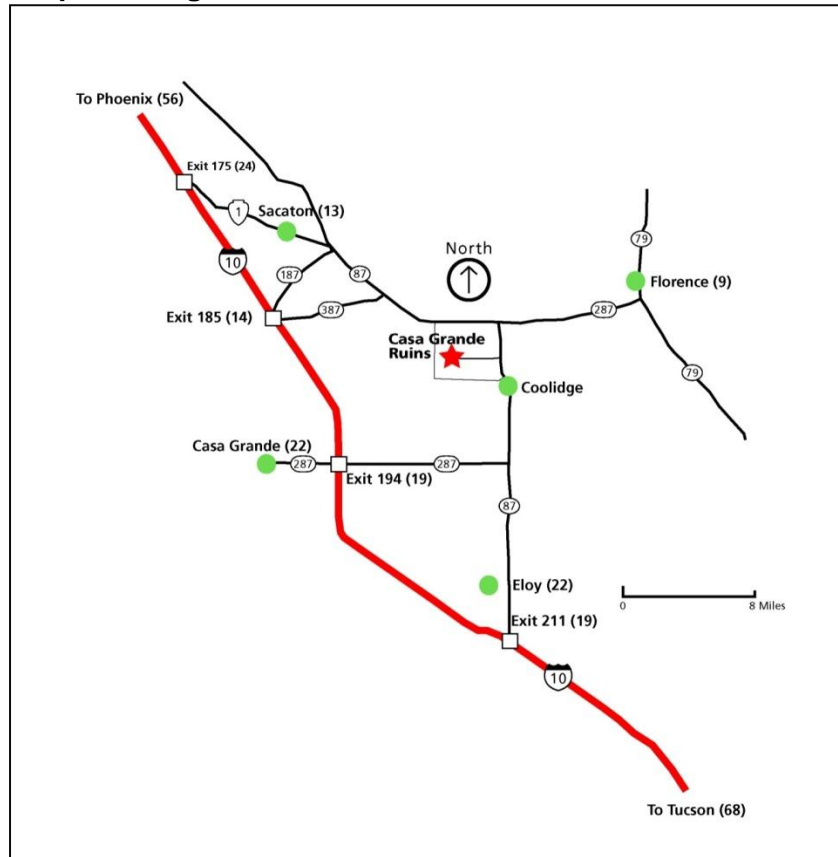
Casa Grande Ruins National Monument

Casa Grande Ruins National Monument is located in the City of Coolidge, Arizona approximately 60 miles southeast of Phoenix and 70 miles northwest of Tucson. The City of Coolidge is a small community predominantly supported by farming and tourism. The Monument was authorized in 1889, proclaimed as a cultural preserve in 1892 and re-designated as a national monument by proclamation in 1918 “in order that better provision may be made for the protection, preservation and care of the ancient buildings and other objects of prehistoric interest thereon” (Wilson, 1918). As a result, CAGR became the first prehistoric and cultural preserve to be established in the United States and is the fifth oldest unit in the National Park Service.

The monument encompasses 472.5 acres, contains 61 documented prehistoric archeological sites and 15 historic structures that have been determined eligible for listing on the National Register of Historic Places. Only three of the Classic Period Hohokam sites are open to the viewing public without a ranger guide or special use permit. The rest of these sites are managed as backcountry sites where both archeology and wildlife resources are more protected from human impacts. While many prehistoric archeological sites have been the subject of limited archeological testing, not a single site within the monument has been fully excavated. 80% of archeological sites within the monument have an assessed depositional integrity of “Well Preserved” or “Excellent” condition. Urban encroachment, combined with a dropping water table over the past hundred years, has cumulatively reduced plant and animal diversity within the monument. Pest impacts to archeological sites have been documented as early as the 1930s (NPS 1935 files). At the time CAGR was established, it was situated in a rural area. As time has passed, populations have grown and modern development now extends right up to the edge of CAGR’s legal boundaries. The current landscape is dominated by creosote scrublands and a limited number of plant species that are native to the Sonoran Desert. Yet this small monument is home to a multitude of animal and insect species; some of which periodically pose a threat to resource preservation, or human health and safety.

LOCATION

Figure 1. Map showing the location of Casa Grande Ruins National Monument



BACKGROUND

Archival records describe rangers spending their evening hours shooting the rodents that burrowed into archeological sites walls and floors. Bees tormented visitors long before the Africanized varieties arrived. Rodents bit park rangers and rabbits ate the ornamental gardens. Bats nested in the structural cracks (Jackson, 1939), and owls nested in the center room of the Great House (Winter, 1936). The use of pesticides and various other chemical methods were employed to control vertebrate and invertebrate pests at CAGR throughout the history of the monument (Currie, 1998 and 2001). Early pest management strategies did not necessarily evaluate long-term effects on the environment, native species, nor archeological site preservation. Numerous studies and reports have been generated on pest impacts to resource conservation and archeological site preservation since CAGR was established.

During the 1930s and 1940s, Casa Grande hosted many naturalist studies. Wildlife observation reports included data on resident bird populations and interactions between birds, rodents, and humans during this time period. The Southwestern Monuments Monthly Reports describe owls nesting in the great house from February 1936 to May 1941. Numerous accounts of this predatory species contributing to the control of native rodent populations are included in the reports. Various plans to stabilize archeological sites and protect prehistoric walls from animal damage are also abundant in correspondence from the 1960s. Products were applied to ruins walls to deter birds in 1968 (NPS files). Further treatments and habitat modification was discussed in this correspondence. Specifically

noted, were the predatory controls offered by nesting owls within the Ruins Shelter, animal damage occurring in structural cracks of the Great House, and animal damage occurring within architectural features within the Great House. At the conclusion of this correspondence it was advised that permanent modification of the Great House to make it animal-proof was not the best option to ensure resource protection.

The 1990s saw a considerable increase in the numbers of birds roosting and nesting in the Great House. This increase was so great that up to five gallons of bird debris (feces, feathers, nest material and dead young) per week fell onto interior ruin floors and had to be manually removed. Rodents had hollowed out the interiors of some walls and burrowing was damaging other archeological sites (Swann et al. 1994). Despite the duration and severity of the problem, no pest management treatments were implemented on a long-term, sustained basis. An integrated Pest Management Plan was produced that contained a wealth of data, pest management options and monitoring recommendations (Hodenbach, 1997). This was immediately followed by a Historical Pesticide Use Study in 1998 (Currie, 1998). Unfortunately, staffing levels were insufficient within CAGR to evaluate the environmental impacts of these recommendations and implement them.

Concerns about pest damages were renewed in February of 2005, when rangers became alarmed at finding golf ball sized pieces of caliche that had been displaced by pigeons and from the increased number of rats living in the Great House. Loss of historic wall materials was attributed to pest animals pecking at the walls, nesting within archeological features, and roosting on structural supports. Weekly sweepings of animal debris collected within the Great House varied greatly. Records reveal quantities massive as 6800 grams plus one dead bird removed the week of 4/12/2005 or as small as 37.7 grams of debris removed the week of 10/2/2006. The average mass of material removed from the Great House since December of 2004 amounts to 3830 grams per month. This material predominantly consists of nesting material and animal feces but also includes dead birds and prehistoric construction materials that were dislodged by pest activity. Bird debris poses a risk to human health and safety as it may contain: salmonellosis, tuberculosis and a number of bacterial, fungal, viral and protozoal diseases¹.

The Pest Problem at CAGR:

Protection of prehistoric architecture, subsurface features, artifacts and all other archeological evidence is essential to fulfill the intent of CAGR enabling legislation. Birds, mammals, insects, algae, and bacteria, that under ordinary circumstances may not be considered pests, can pose threats to archeological site preservation and/or human safety. Within unique and irreplaceable archeological sites, burrowing, feeding, nesting, roosting or other common activities can threaten resource preservation.

In 2005, an Interdisciplinary team was convened to review the 1997 IPM plan and determine what management actions were needed. The team decided to approach the problem in two phases. The first phase was to immediately address the need to reduce pest populations that threatened human health, safety, and to protect cultural resources. The second phase is addressed in this environmental analysis in the alternatives section.

CAGR staff observed a pervasive 'honeycomb effect' from numerous rodent burrows resulting from an overly abundant population of round-tailed ground squirrels throughout some areas of the monument. Researchers attributed this increase in burrow density to increased soil moisture that allowed for easier digging and/or natural population cycles (Monroe personal communication). Dr. Karen Monroe completed a study in 2007 to "determine the movement patterns of round-tailed ground squirrels", contribute data toward a better understanding of the "social system" within a single animal population, and "delineate periods of above ground activity of various age and sex classes of round-tailed ground

¹ <http://web.birdbarrier.com>

squirrels” (Monroe, 2007). Initially, she intended to tag every squirrel in the park and determine their population size at CAGR, but soon realized that the population numbers and population distribution were too great.

Anecdotal information estimates burrows may span as much as 18 inches below the soil surface and approximately 10 feet long (Monroe pers comm.). This data was confirmed in the park through Ground Penetrating Radar by James Doolittle in 2007. Actual measurement of a network of round tailed ground squirrel burrows, not located within an archeological site, spanned an area that measured approximately 1 meter in diameter and 30 cm in depth. (Doolittle, 2007) High burrow densities were recorded on a number of cultural sites. The burrows tunnel underground for several feet undermining the stability of the surface and often caving in as people walk across above them. This poses a risk of serious injuries. Artifacts being dug up and displaced by burrowing animals also result in damage to the artifacts and their stratigraphic, archeological context. Archeological sites were jeopardized as squirrels intermixed and degraded previously buried archeological artifacts. Artifacts were being exposed to wind, water, and theft. Burrows dug by rodents at the monument were also found to undermine the bases of prehistoric structures. Many of the excavated, prehistoric walls have been historically encapsulated with modern treatment materials. In some cases, these materials are more rigid than the underlying prehistoric walls. Rodents have been observed burrowing beneath the encapsulation materials to make a home within the softer, original, prehistoric wall materials. This results in a loss of original wall features and increases the potential for whole scale wall collapse.

The Monument has been conducting extensive surveys and monitoring of pest species populations and their impacts to monument resources. CAGR conducted a condition assessment of 59 archeological sites in 2006 and regularly documents animal damages to key sites identified during that survey. Once a month, a GPS unit is used to record the burrowing holes created by various pest species. Since this monitoring protocol was established, twenty-one coyote dens have been recorded within the legal boundaries of CAGR. These dens are monitored for activity and expansion. There have also been 30 burrowing owl dens recorded with the GPS with only 8 being active burrows. The pest debris in the Great House gets swept, weighed, and recorded weekly. Birds within the Great House are counted and recorded daily. Feral dogs are a human health and safety issue and they are recorded every time they are seen. Vertebrates that die within the public area are properly disposed of and recorded. Bats if found in public areas during daylight hours are captured or collected and sent to Colorado State University for necropsy and disease examination. CAGR records whether the bats had tested positive for rabies. Pests that pose a potential threat to public safety and/or structural damage to historic structures are recorded and managed. During peak times, the fruits and seeds from ornamental landscape plants are collected in order to prevent these seeds and fruit from becoming an abundant food source that attracts pest species to public areas. Bird and bat debris poses a risk to human health and safety as it may contain: salmonellosis, tuberculosis and a number of bacterial, fungal, viral and protozoa diseases. Some of the bats found in the Great House have already tested positive for rabies.

The use of shooting, trapping, and chemical pesticides for the control of round tailed ground squirrels was tested in the park by APHIS in August, 2005. Shooting squirrels is inefficient as squirrels learn to hide after the first couple of shots. Trapping is time consuming, with limited success. The use of zinc phosphide was highly successful and following one treatment, no squirrels were observed on the treatment area for several weeks. APHIS biologists predict project objectives would have less than a 75% success rate with trapping and shooting, and no chemical pesticides (personal communication Mark Lutman 10/21/05). Round tailed ground squirrel research by Monroe suggests that the trapping success would be even lower than that predicted by APHIS. The limited success of trapping and shooting does not meet our management objectives of having 0-10 squirrels observed at any one time in areas of high priority treatment areas. It also does not meet management policy Director's Order #77-7 to be cost effective. Chemical pesticides can be applied in one night, followed by two days of observations for carcasses and sick animals. Trapping with the current high densities could take up to

a month in the early spring and another month in late summer. Based on 2006 cost estimates the use of chemical pesticides to treat rodents is approximately \$2500. The cost of trapping is estimated to be at least \$17,000 and is not predicted to meet management objectives. Currently, no relocation area for squirrels is available. Therefore, considerable time and money would be spent on trapping and rodents would continue to be euthanized.

Monroe raised an additional concern about the use of baited traps on the perimeter of the treatment area (personal communication with 1/17/06). Based on treatments applied in August, 2005, there is a serious concern that the bait would draw in non-target squirrels from other non-treatment areas of the monument. This would result in the death of squirrels that are not causing direct impacts to human health and safety and cultural resources. Care has been taken in the development of the preferred alternative to try to ensure that activities (such as landscaping practices) are not drawing in additional squirrels to the high priority treatment areas. The use of bait is of particular concern when the squirrels are coming out of hibernation and food sources are scarce, which is also the targeted treatment time as it is before reproduction.

Isolated IPM treatments have been implemented to control and deter pests within historic structures. These treatments are covered within the constraints of CAGR current management so long as the proposed treatment fits the following criteria: (1) the treatment action is approved by the CAGR IPM Team, (2) the proposed treatment is determined to be equal to or less than a minor impact to monument resources through interdisciplinary review, (3) it fits an existing NEPA Categorical Exclusion, and (4) it fits an existing NHPA Programmatic Exclusion. If the treatment includes use of a pesticide, additional review is required at the regional level of the NPS through the Pesticide Use Permitting system (PUPS), and application of any pesticide must be conducted under the direct supervision of an individual who currently holds a State of Arizona Office of Pest Management Pesticide Applicator License. Prior to 2005, no pesticides had been approved to control vertebrate pests. Due to potential risk of human injury and damage being done to cultural resources, the CAGR Superintendent signed a Categorical Exclusion in March of 2005, to immediately implement the use of pesticides to reduce vertebrate pest populations on a limited basis. The experience gained from trying a number of control techniques and their subsequent success or lack of success forms the basis for the pest management treatments recommended in this plan.

NPS has recognized the need to be proactive in order to prevent resource damage and to be ready to immediately respond with the most efficient and effective treatments should monitoring and health concerns dictate the need for treatment. In addition to threats from non-native invasive species, the integrity of cultural resources can be threatened by native species that are 'out-of-place', nesting in structural cracks within prehistoric walls or burrowing into ancient sites and impacting the structural integrity of the irreplaceable resources.

PURPOSE AND NEED

The purpose of this EA is to evaluate and ensure implementation of IPM procedures at the Monument. As defined by the National Park Service Management Policies (2006), "pests are living organisms that interfere with the purposes or management objectives of a specific site within a park, or that jeopardizes human health or safety." This document covers treatments at CAGR, and areas where there is a Memorandum of Understanding, land transfer, or permit giving NPS management authority. IPM focuses on preventative measures and treatments that maintain a delicate balance between the health of natural resources, cultural resources, and those people who enjoy them. It addresses ongoing impacts caused by specific individuals within an established animal population as well as addressing the potential impacts posed by non-native, invasive species and overpopulation of native species whose natural balances within these small monuments, have been disrupted by human impacts such as encroaching development that are outside of the authority of the NPS to regulate.

A plan is needed to guide CAGR managers in containing, suppressing, or eradicating invasive vertebrate and invertebrate pest populations at Casa Grande Ruins National Monument to prevent the accelerated deterioration of sensitive resources or risk to human health and safety caused by pest species. Bird nesting and roosting provides copious urine and fecal material which is acidic and reacts with the alkaline walls of the earthen architecture, causing damage. Nesting material in the viga sockets of the Great House, cracks, crevices and other areas may create possible degradation. Rodents and predators that prey on rodents burrow into archeological sites, disrupting stratigraphic layers of archeological evidence. Insects breeding in the fecal material occupying the nests provide potential transmission of disease organisms to Monument staff and visitors. Management of the pests and mitigation of adverse effects is the objective of IPM.

Pest animal species that have been commonly documented to pose a threat to resource preservation at these monuments include but are not limited to: common Pigeon (*Columba livia*), European starling (*Sturnus vulgaris*), house finch (*Carpodacus mexicanus*), round-tailed ground squirrels (*Spermophilus tereticaudus*), honey bees (*Apis mellifera*), black widow spider (*Latrodectus mactans*), Arizona recluse spider (*Loxosceles arizonica*), subterranean termites (*Reticulitermes Hesperus*), little brown bats (*Myotis lucifugus*), house mouse (*Mus musculus*), roof rats (*Rattus rattus*), deer mice (*Peromyscus spp*), wood rat (*Neotoma spp.*), coyote (*Canis latrans*), kit foxes (*Vulpes macrotis*), gray foxes (*Urocyon cinereoargenteus*), and feral dogs. These species are causing the most concern for human health and safety and the most damage to the cultural resources.

Appropriate Use

Section 1.5 of *Management Policies* (2006), "Appropriate Use of the Parks," directs that the National Park Service must ensure that park uses that are allowed would not cause impairment of, or unacceptable impacts on, park resources and values. A new form of park use may be allowed within a park only after a determination has been made in the professional judgment of the park manager that it will not result in unacceptable impacts.

Section 8.1.2 of *Management Policies* (2006), Process for Determining Appropriate Uses, provides evaluation factors for determining appropriate uses. All proposals for park uses are evaluated for":

- consistency with applicable laws, executive orders, regulations, and policies;
- consistency with existing plans for public use and resource management;
- actual and potential effects on park resources and values;
- total costs to the Service; and
- whether the public interest will be served.

Park managers must continually monitor all park uses to prevent unanticipated and unacceptable impacts. If unanticipated and unacceptable impacts emerge, the park manager must engage in a thoughtful, deliberate process to further manage or constrain the use, or discontinue it.

From Section 8.2 of *Management Policies*: "To provide for enjoyment of the parks, the National Park Service will encourage visitor use activities that

- are appropriate to the purpose for which the park was established, and
- are inspirational, educational, or healthful, and otherwise appropriate to the park environment; and
- will foster an understanding of and appreciation for park resources and values, or will promote enjoyment through a direct association with, interaction with, or relation to park resources; and
- can be sustained without causing unacceptable impacts to park resources and values."

Management Objectives

The objectives set forth in this plan are based upon previously established NPS guidelines and policies. The enabling legislation for CAGR and the Foundation Statement identify preservation of ancient buildings as a purpose for which the park was established. Maintaining an IPM plan is essential for the ongoing preservation of CAGR resources, and ensuring a safe environment for visitors and staff to appreciate CAGR resources. This IPM plan will ensure that management actions are conducted in a manner that is sustainable without posing a detriment to the preservation of the archeological resources that CAGR was established to protect. The 11 Step Process to Developing and Implementing an Integrated Pest Management Strategy and the Vanishing Treasures Program Revised 5 Step Process to Develop and Implement Integrated Pest Management at Vanishing Treasures Sites guided this IPM planning effort at Casa Grande Ruins National Monument. The enabling legislation established CAGR to preserve and protect these resources. Monitoring, research, and interdisciplinary discussions have aided CAGR staff to identify management zones, action thresholds, pest behaviors, and pest biology.

The scope of this environmental assessment includes all lands within the current boundaries of the monument and the attached list of adjacent lands that are being considered for expansion of the monument. Alternatives were framed through discussion among Casa Grande Ruins National Monument land managers, the Southern Arizona Office (SOAR) of the NPS, United States Department of Agriculture Animal and Plant Health Services: Wildlife Services Division, State of Arizona Structural Pest Control Commission, International Pest Management Institute, and Wild Edge Conservation Science. NPS Intermountain Region planning staff and integrated pest managers at both the regional and national levels facilitated and advised park staff throughout this process.

Long-term goals for this project are to reduce threats to human health and safety while also enhancing resource protection and preservation. Potential risks to human health and safety, resource protection, resource preservation, visitor use, cost effectiveness, and the sustainability of each alternative as a long-term management approach were used as evaluation criteria.

Short-term goals used to evaluate each alternative include: (1) Zero human injuries from tripping/falling into collapsed burrows. Zero incidents of injury or illness to humans from pest species interaction. (2) Zero structural impacts or damages to standing architecture within archeological sites. Fifty percent less bird debris collected in the Great House during routine cleaning (compared to 2004-2005 amounts). (3) Zero to 20 active rodent holes observed in IPM Management Zone #3. Zero to 40 active rodent holes observed in IPM Management Zone #4. Zero evidence of active pest damage in the Great House. Reduce impacts to natural resources from high populations and burrow densities of round tailed ground squirrels. (4) Implementation of regularly scheduled, cost effective integrated pest management practices. (5) Enhanced education for visitors and staff regarding resource preservation, as well as human health and safety issues that are related to integrated pest management. The IPM Management Zones are described in further detail later in this document.

Objectives for this Integrated Pest Management Plan are:

- reduce risks to the health and safety of park visitors, employees and guests
- reduce damage to the cultural and natural resources
- ensure that CAGR resources are protected from potential impairment
- enhance the visitor experience through the protection of natural and cultural resources
- ensure that all IPM treatments are reversible and use compatible treatment materials
- prevent additional pest species or invasions from occurring

CAGR proposes to be proactive versus reactive by stopping pest species before they become a serious threat to the park's natural and cultural resources. When the use of pesticides is warranted, CAGR proposes to use the least toxic effective pesticide only as a last resort and only after making a good faith effort to control pest species by using other IPM techniques.

SCOPE OF PLAN

The scope of this document includes guidelines and references for long-term management planning that would reduce the impacts of (or threats from) vertebrate and invertebrate pests to human health and safety, natural resources protection, and cultural resource preservation within the authorized boundaries of CAGR. Although this EA considers impacts within the monuments and adjacent areas that could reasonably be impacted by IPM actions, only IPM activities occurring within the identified boundaries of the Monument and those that have been previously identified for inclusion within the proposed boundary expansion, and/or involve NPS resources are within the scope of this document.

This document is intended to serve as long-term guidance for all IPM activities. Therefore, the approach is general enough to address management actions without becoming excessively restrictive. It provides resource managers with multiple treatment options and allows them to select the most appropriate treatment option or combination of treatments to minimize potential impacts and maximize overall management success. It identifies the required procedures for internal review and permitting at both the state and federal levels. It is also flexible enough to allow for future use of treatment actions not currently available, and to address new invasive species that may colonize the monument, provided that the effects remain similar to or less than those described in this document. Additional detail is included in the attachments to this EA to serve as a practical guide for site-specific and species-specific planning considerations at CAGR.

RELATIONSHIP TO OTHER PLANS AND POLICIES

All IPM procedures and planning documents must be in compliance with National Park Service's *Management Policies* (2006), Director's Order 12 – *Environmental Impact Analysis*, and Director's Order 77-7 - *Integrated Pest Management*.

This EA is prepared in accordance with regulations of the Council on Environmental Policy Act (CEQ) (40 DFR 1500 et seq.) and part 516 of the U.S. Department of the Interior's Departmental Manual (516 DM). The National Environmental Policy Act (NEPA) is the basic national charter for environmental protection; among other actions it calls for examination of impacts on components of affected ecosystems. Section 106 of the National Historic Preservation Act of 1966 (as amended through 2000) mandates that Federal agencies take into account the effects of their actions on properties listed or eligible for listing in the National Register of Historic Places.

This IPM Plan for the monument provides basic pest management guidelines to help preserve cultural resources, structures, monument grounds, and natural resources, while also protecting the health and safety of both staff and visitors. As new information and IPM methods would develop over time, the CAGR IPM plan should be reviewed and updated.

The Superintendent is ultimately accountable for responsible pest management at the monument and designates an IPM Coordinator to implement the IPM Plan. The IPM Coordinator would work with NPS staff, state agencies, and other federal agencies to implement the IPM plan. This Plan would be constructed according to the many authorities, legal requirements, and policies that dictate *all* park activities, in addition to those that deal *specifically* with natural, cultural, and pest issues.

Authorities, Legal Requirements, Policy

National Park Service (NPS) policy establishes an IPM approach as the required method for managing pests in the NPS (NPS 2006 Management Policy 4.4.5.2). Development of an IPM program is based on

and directed by various policies, laws, regulations, executive orders, and the enabling legislation that established each NPS unit. The following documents provide direction for management relating to pest management. Documents that specifically relate to IPM practices at CAGR are detailed below.

Federal Regulations

Extensive federal legislation has been enacted to ensure that both cultural and natural resources are protected and preserved within National Parks. At CAGR, the enabling legislation sets forth a park mission to protect and preserve cultural resources. The following legislation must be considered when implementing an IPM plan at CAGR. (Further NPS-specific detail is provided below under the heading of NPS Director's Orders.)

- 1892 Executive Order 6144-'92 (June 22, 1892 – No. 28A)
- 1916 National Park Service Organic Act
- 1918 National Monument Proclamation for Casa Grande Ruins National Monument
- 1918 Casa Grande Ruins National Monument Enabling Legislation
- 1918 Migratory Bird Treaty Act
- 1935 Historic Sites Act
- 1947 Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)
- 1949 National Trust for Historical Preservation Act
- 1955 Museum Properties Management Act
- 1966 National Historic Preservation Act (NHPA)
- 1969 National Environmental Policy Act (NEPA)
- 1972 Federal Environmental Pesticide Control Act
- 1973 Endangered Species Act
- 1979 Archeological Resource Protection Act (ARPA)
- 1979 President Carter's Memorandum
- 1994 Occupational Health and Safety (OSHA) Hazard Communication Standard
- 1995 The Secretary of the Interior's Standards for Rehabilitation
- 2003 Preserve America Executive Order 13287
- Title 41 CFR 102-74.35 Facility Management - Occupancy Services
- Executive Order 11870 concerning Animal Damage Control
- Executive Order 11987 concerning Exotic Organisms
- Executive Order 12088 concerning Pollution Control

NPS Guidelines and Policies

Full implementation of IPM practices in NPS field areas has been a service-wide goal for more than 15 years. NPS Management Policy (2006) outlines the basic framework of the NPS IPM program. Information describing the design, application, and evaluation of park IPM programs (and regulations and policies governing them) is found in Chapter 2, Integrated Pest Management, of NPS-77, Natural Resources Management Guideline (1991). This guideline provides details of the program under the following headings:

- NPS approval and review process for all pesticides used in the park
- Overview of IPM
- Components of an IPM program
- IPM Program Operations
- Roles and Responsibilities
- Report forms and directions for completing them

Additional guidelines relating to the park pest management program are found in other chapters of NPS-77. Vegetation Management; Native Animal Management; Freshwater Resources Management;

Endangered, Threatened, and Rare Species Management; Exotic Species Management; Hazardous Waste Management; and Public Health and Safety are all discussed in chapter two while chapter three focuses on Agricultural Use, Right-of-Way and Easements, and Backcountry Recreation Management. Environmental Compliance is discussed in chapters four and five providing helpful information regarding Special Use Permits and Collections Management.

National Park Service Director's Orders (DO):

(Available online at <http://home.nps.gov/applications/npspolicy/DOrders.cfm>)

DO 12 Conservation Planning, Environmental Impact Analysis, and Decision-Making (NEPA)

DO 13 Environmental Leadership

DO 20 Agreements

DO 24 Museum Collections Management

DO 25 Land Acquisition

DO 28 Cultural Resources Management

DO 36 Housing Management

DO 48 Concessions

DO 77-7 Integrated Pest Management

DO 77-8 Threatened and Endangered Species

DO 83 Public Health

DO 12 *Conservation Planning and Environmental Impact Analysis, and Decision-making* along with the companion Handbook 12. Together, these documents set forth the policy and procedures by which the National Park Service carries out its responsibilities under the National Environmental Policy Act (NEPA)

The NPS Museum Handbook, provides state-of-the-art guidance on museum pest management that include identification of common pests, recommendations for an IPM program to specifically address the unique needs of museum collections, and actions to take if an infestation is discovered.

National Park Service Management Policies 2006- 4.4.5.2 Integrated Pest Management Program

This directs the National Park Service and each park unit to use an IPM approach to address pest issues in order to reduce risks to the public, park resources, and the environment from pests and pest-related management concerns. It states that proposed pest management activities must be conducted according to the IPM process prescribed in Director's Order #77-7: Integrated Pest Management. Pest issues must be reviewed on a case-by-case basis.

Vanishing Treasures Sustainable Pest management Guidelines for Cultural Resource Preservation, 2006 Establishes a set of prerequisite questions required for the development and implementation of an IPM program. Provides a detailed discussion of how NPS sites within the Vanishing Treasures program should implement the 11 step process for implementing IPM plans.

Prerequisite IPM questions:

1. Is it a pest? (Is it interfering with your management objectives?)
2. Is it a native or exotic (or nonnative) species?
3. What conditions foster the pest?
4. What management zone is it?
5. What are the chances of successful management?

11 Step Process to Developing and Implementing an Integrated Pest Management Strategy

1. Describe your site management objectives and establish short and long-term priorities.
2. Build consensus with stakeholders-occupants, decision makers and technical experts (ongoing).
3. Document decisions and maintain records.

4. Know your resource (site description and ecology).
5. Know your pest. Identify potential pest species; understand their biology, and conditions conducive to support the pest(s) (air, water, food, shelter, temperature, and light).
6. Monitor pests, pathways; human and environmental factors, including population levels and phenological data.
7. Establish "action thresholds," the point at which no additional damage or pest presence can be tolerated.
8. Review available tools and best management practices. Develop a management strategy specific to your site and the identified pest(s). Tools can include: 1) no action, 2) physical, 3) mechanical, 4) cultural, 5) biological, and 6) chemical management strategies.
9. Define responsibilities and implement the lowest risk, most effective pest management strategy; in accordance with applicable laws, regulations, and policies.
10. Evaluate results; determine if objectives have been achieved; modify strategy if necessary (adaptive management).
11. Education and outreach. Continue the learning cycle, return to Step 1.

State Regulations Covering Pesticide Use

Casa Grande Ruins National Monument will abide by all applicable Arizona state and federal laws for the use of pesticides in accordance to The Office of Pest Management. For a copy of state pesticide regulations or certification testing, contact the State of Arizona, Structural Pest Control Commission/Office of Pest Management, 9545 East Doubletree Road, Scottsdale, AZ 85251, 602/255-3664. Further information regarding the State of Arizona, Structural Pest Control Commission regulations may be found at the following website: <http://www.sb.state.az.us/>. The Arizona Department of Agriculture, Environmental Services Division also regulates some pesticide uses within National Park Service lands that are not otherwise covered under State of Arizona, Structural Pest Control Commission regulations. The Arizona Department of Agriculture Environmental Services Division regulations may be referenced at the following website: <http://www.azda.gov/ESD/esd.htm>.

Monument Specific Policy

The staff of CAGR is committed to the implementation of an IPM approach for those pests threatening the resources, and personal health and safety. The proposal to use the full range of IPM techniques at CAGR is consistent with previous planning efforts. The following documents would also guide management of pest problems at CAGR.

The General Management Plan for CAGR is outdated and recent efforts have been made to address this planning need. The first step in identifying park needs was initiated in 2007. The Casa Grande Ruins National Monument *Foundation Statement for Planning and Management* (2007) prepared the following succinct purpose statement:

- The Casa Grande Ruins National Monument was set aside for the preservation and interpretation of the Casa Grande ruins and other ancient buildings and objects of prehistoric interest.

Significance statements capture the essence of the national park's importance to our country's natural and cultural heritage. Defining the park's significance helps managers make decisions that preserve the resources and values necessary to accomplish the park's purpose. This document focused on monument significance as a basis for evaluating all subsequent management actions, including all IPM actions needed to ensure continued resource protection and archeological site preservation. One goal of IPM at CAGR is to manage pest populations in such a way that they cannot damage the integrity, research value, and sacred significance of archeological resources.

The seven significance statements, as described in the *Foundation Statement* (2007) are:

- Casa Grande Ruins National Monument was the first archeological site to be set aside by the U.S. government and sparked the beginning of the archeological resource preservation

movement in America. The integrity of the resources remains high due to the early date of the site's establishment (1892).

- The physical prominence and sophisticated construction of the Casa Grande made it a dominant landmark in early European exploration and western migration.
- Casa Grande Ruins National Monument is a sacred place for many American Indians. The Tohono O'odham Nation, Salt River Pima-Maricopa Indian Community, Gila River Indian Community, Ak-Chin Indian Community, Hopi Tribe, and Pueblo of Zuni all claim an ancestral affiliation to the Hohokam and this site.
- Casa Grande Ruins National Monument exemplifies Hohokam adaptation to the Sonoran desert environment, including utilization of nearby Gila River for creating the most extensive irrigation-based agricultural desert society in North America.
- The Casa Grande is the only surviving example of a multi-story, freestanding earthen "great house" structure from the Hohokam culture. It represents the final evolution of architectural tradition of the late Classic Period.
- Hohokam architecture preserved by Casa Grande Ruins National Monument demonstrates architectural sophistication with its earthen construction methods, orientation, desert setting and architectural features such as platform mounds, ballcourts, and plazas. Classic Period workmanship is testament to an organized and productive society and represents the peak of Hohokam culture.
- Research conducted at Casa Grande Ruins National Monument was pivotal in the development of archeological analysis and advanced the later archeological and architectural conservation movements.

The CAGR Statement for Management (NPS 1995) set the following Management Objectives:

- To protect and preserve the prehistoric, historic and natural resources to the maximum extent possible.
- To formulate both short-term and long-term plans based on sound research for the protection, preservation, and maintenance of the natural, historical, and cultural resources of the monument.
- To monitor all prehistoric, historic, cultural, archeological and natural resources. To adequately document status and to use data in the effective management of these resources.

The Historical Pesticide Use Study for Casa Grande Ruins National Monument (Currie Enterprises International Pest Management Institute, 1998) set forth the following objectives:

- Develop methods for determining pesticide use from actual use records, historical records such as land use documentation, weather patterns, insect or other pest surveys, University of Arizona pesticide use recommendations, or other sources.
- Determine the actual or potential pesticides that have been used within the monument as far back in recent history (20-50 years) as possible.
- Determine the actual (or potential) pesticides that have been used on the properties surrounding the monument as far back in recent history (20-50 years) as possible.

A wealth of information is also provided for integrated pest management at CAGR within the following publications (some of which are included as attachments to this document):

- The Integrated Pest Management Plan, G & I Consultants, Gerry Hodenbach, 1997.
- Integrated Pest Management Report, International Pest Management Institute, Bill & Jean Currie, 2009.

INITIAL PUBLIC SCOPING

Scoping provides a mechanism for identifying resources that may be affected by a project proposal, and to explore possible alternative ways of achieving proposal objectives, while minimizing adverse impacts. CAGR conducted both internal scoping with appropriate National Park Service staff and external scoping with the public and interested/affected groups and agencies.

Internal scoping was initiated on December 2, 2004 during a meeting at Casa Grande Ruins National Monument. A site visit was conducted to view impacts to archeological sites from birds and rodents. Comments were solicited from NPS staff from several parks including: Tonto National Monument, Saguaro National Park, the Sonoran Desert Inventory and Monitoring Network, Organ Pipe Cactus National Monument, Montezuma Castle National Monument, and Southern Arizona Office. U.S. Geological Survey staff also participated in the meeting and provided input. An Interdisciplinary Team, comprised of staff from Casa Grande Ruins and the Southern Arizona Office, convened on February 7, 2005 to discuss the purpose and need for an IPM project, identify various alternatives, potential environmental impacts, and possible mitigation measures.

External scoping was conducted through a series of newspaper articles, tribal consultations, and public meetings. Meetings were held to discuss the purpose of the project, various alternatives, environmental consequences, and public outreach. Consultations were held with representatives from the cities of Coolidge and Florence; Pinal County; the Tohono O'odham Nation (Tohono O'odham), Gila River Indian Community (Gila River), Ak-Chin Indian Community (Ak-Chin), and Salt River Pima-Maricopa Indian Communities (Salt River); as well as representatives from the Arizona State Historic Preservation Office, the Arizona State Museum, and members of the general public. Consultation letters were also sent to the Hopi Tribe and Pueblo of Zuni. These letters were followed up with correspondence and discussions on-site. Newspaper articles have been written about the bird and rodent issue at the Monument and fifty-six papers nationwide have printed the story. Those articles resulted in comments, emails and phone calls from concerned individuals. On March 10, 2005, Casa Grande Ruins held an open house for individuals interested in the pest control issue. All five attendees of the after-hours open house (held from 5pm to 7pm) left written comments which supported the goal of minimizing and controlling the pest populations at CAGR.

Resource damage and potential threats to public health and safety that were observed in 2005 triggered additional monitoring and environmental assessment of pest impacts during the period from 2006 to 2008. The Vanishing Treasures Program Workshop for Sustainable Pest Management was hosted in Scottsdale Arizona from March 14-17, 2006. This workshop focused on the development of guidelines for Integrated Pest Management within archeological parks. Casa Grande Ruins National Monument was presented as a case study and featured prominently in workshop discussions. In 2007, CAGR staff worked closely with the staff from the United States Department of Agriculture Animal and Plant Health Services, Wildlife Services division (USDA-APHIS), and Wild Edge Conservation Science, and the State of Arizona Structural Pest Control Commission to research pest management options and treat individual pests as needed. Additional articles featuring CAGR Integrated Pest Management approaches were published in local newspapers. Only one additional public comment was received in response to the Coolidge Examiner on January 29, 2007. This comment was a statement of support for current practices at CAGR. The current management approach for IPM at CAGR was also presented at the NPS Intermountain Region's *First Regional Resource Management Conference of the Twenty First Century* on May 19-23, 2008 as a case study for resource management. Brief pest management updates have periodically been presented by CAGR staff at the Four Southern Tribes of Arizona Cultural Resource Management working group meetings every year from 2005 to 2009.

IMPACT TOPICS RETAINED FOR FURTHER ANALYSIS

Impact topics for this project have been identified on the basis of federal laws, regulations, and orders; National Park Service *2006 Management Policies*; and National Park Service knowledge of resources at Casa Grande Ruins National Monument. Impact topics that are carried forward for further analysis in this Environmental Assessment are listed below along with the reasons why each impact topic is further analyzed. For each of these topics, the following text also describes the existing setting or baseline conditions (i.e. affected environment) within the project area. This information would be used to analyze impacts against the current conditions of the project area in the *Environmental Consequences* chapter.

Soils

According to the National Park Service's *2006 Management Policies*, the National Park Service would preserve and protect geologic resources and features from adverse effects of human activity, while allowing natural processes to continue (NPS 2006). These policies also state that the National Park Service would strive to understand and preserve the soil resources of park units and to prevent, to the extent possible, unnatural erosion, physical removal, or contamination of the soil, or its contamination of other resources. Some pest species impact the soil resource through burrowing. Mechanical and chemical treatments could impact the soil resource. Therefore, this topic would be analyzed in detail.

Archeological Resources

Section 106 of the National Historic Preservation Act, as amended in 1992 (16 USC 470 *et seq.*); the National Park Service's Director's Order 28 *Cultural Resource Management Guideline*; and National Park Service *2006 Management Policies* (5.3.5.1) require the consideration of impacts on historic properties and archeological resources that are listed on or eligible to be listed in the National Register of Historic Places. The National Historic Preservation Act requires federal agencies to coordinate consultation with State/Tribal Historic Preservation Officers any time a federal action has the potential to impact properties listed on or eligible for listing on the National Register of Historic Places.

As steward of many of America's most important cultural resources, the NPS is charged to preserve historic properties for the enjoyment of present and future generations. Management decisions and activities throughout the National Park System must reflect awareness of the irreplaceable nature of these resources. The NPS would protect and manage cultural resources in its custody through effective research, planning, and stewardship and in accordance with the policies and principles contained in the *2006 Management Policies* and the appropriate Director's Orders.

In addition to the National Historic Preservation Act and the National Park Service *2006 Management Policies*, the National Park Service's Director's Order 28, affirms a long-term commitment to the appropriate investigation, documentation, preservation, interpretation, and protection of archeological resources inside units of the National Park System. Archeological resources are nonrenewable and irreplaceable, so it is important that all management decisions and activities throughout the National Park System reflect a commitment to the conservation of archeological resources as elements of our national heritage.

Pest species are impacting archeological sites within CAGR by tunneling into prehistoric walls, disturbing the structural integrity of historic architecture, disturbing the stratigraphic sequence of archeological deposits, and discoloring/eroding ancient architecture with body excretions. Therefore this topic would be analyzed in detail.

Museum Collections

According to Director's Order 24 *Museum Collections*, the National Park Service requires the consideration of impacts on museum collections and provides further policy guidance, standards, and

requirements for preserving, protecting, documenting, and providing access to, NPS museum collections. The Departmental Manual (411 DM 1.3) defines museum property (museum collections) as “an assemblage of museum objects collected according to some rational scheme and maintained so they can be preserved, studied, or interpreted for public benefit. Museum objects include prehistoric and historic objects, artifacts, works of art, archival documents [historical and/or scientific documents collections as defined in the Departmental Museum Property Handbook, 411 DM Volume I, Appendix A, Section A.2.d.] and natural history specimens that are a part of museum collections. Museum property does not include those items necessary to display a collection such as exhibit cases, dioramas, special lighting, graphics, etc.” (2:2 NPS *Museum Handbook*, Part I, 2003) In accordance with this definition, only those collections that have been brought into a museum setting would be addressed under this topic. It would be retained for further analysis as it applies to curation and museum management.

Special Status Species\ Wildlife

The Endangered Species Act of 1973 requires examination of impacts on all federally-listed threatened, endangered, and candidate species. Section 7 of the Endangered Species Act requires all federal agencies to consult with the U.S. Fish and Wildlife Service (or designated representative) to ensure that any action authorized, funded, or carried out by the agency does not jeopardize the continued existence of listed species or critical habitats. In addition, the *2006 Management Policies* and Director's Order 77 *Natural Resources Management Guidelines* require the National Park Service to examine the impacts on federal candidate species, as well as state-listed threatened, endangered, candidate, rare, declining, and sensitive species (NPS 2006). Further protection under the Migratory Bird Treaty Act makes it unlawful to pursue, hunt, kill, capture, possess, buy, sell, purchase, or barter any migratory bird, including the feathers or other parts, nests, eggs, or migratory bird products. In addition, this act serves to protect environmental conditions for migratory birds from pollution or other ecosystem degradations. Migratory birds are present in the vicinity of proposed treatments.

The burrowing owl is known to be present and the Tucson shovel-nosed snake may be present at CAGR. Both inhabit burrows and there is the potential to impact these species with treatments to burrowing pest species. Pest bird species may be treated, resulting in potential impacts to migratory birds.

In accordance with the National Park Service's *2006 Management Policies*, the National Park Service strives to maintain all components and processes of naturally evolving park unit ecosystems, including the natural abundance, diversity, and ecological integrity of wildlife (NPS 2006). All monuments have diverse animal populations. The treatment of pest species, particularly vertebrate species, has the potential to impact wildlife habitat. Threatened species, species of concern, and migratory species are known to occur in the project area. Thus, the topic of threatened, endangered species, and wildlife impacts would be analyzed in detail.

Human Health and Safety

According to *2006 Management Policies*, the NPS is tasked to maintain health and safety for all people within the park. Pest species impact human health and safety by creating many risks. Examples include burrows which pose a trip and fall hazard, diseases such as rabies or Hantavirus, stings, and even bites from spiders, snakes, bees, or rodents. Given that pest species impact on human health and safety, this topic would be analyzed in detail.

IMPACT TOPICS DISMISSED FROM FURTHER ANALYSIS

Some impact topics have been dismissed from further consideration, as listed below. The rationale for dismissing these specific topics is stated for each resource.

Water Resources

National Park Service policies require protection of water quality consistent with the Clean Water Act. The purpose of the Clean Water Act is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters". To enact this goal, the U.S. Army Corps of Engineers has been charged with evaluating federal actions that result in potential degradation of waters of the United States and issuing permits for actions consistent with the Clean Water Act. The U.S. Environmental Protection Agency also has responsibility for oversight and review of permits and actions, which affect waters of the United States.

NPS seeks to restore, maintain, and enhance the quality of all park surface and ground waters consistent with the 1972 Federal Water Pollution Control Act, as amended, and other applicable federal, state, and local laws and regulations. There are no natural surface waters within the boundaries of Casa Grande Ruins National Monument, and there are no impacts to water quality. Therefore, a statement of findings would not be prepared and the topic has been dismissed.

Wetlands

For regulatory purposes under the Clean Water Act, the term wetlands means "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas."

Executive Order 11990 *Protection of Wetlands* requires federal agencies to avoid, where possible, adversely impacting wetlands. Further, Section 404 of the Clean Water Act authorizes the U.S. Army Corps of Engineers to prohibit or regulate, through a permitting process, discharge or dredged of fill material or excavation within waters of the United States. National Park Service policies for wetlands as stated in *2006 Management Policies* and Director's Order 77-1 *Wetlands Protection*, strive to prevent the loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. In accordance with DO 77-1 *Wetlands Protection*, proposed actions that have the potential to adversely impact wetlands must be addressed in a Statement of Findings for wetlands.

No wetlands are located in the project area; therefore, a Statement of Findings for wetlands would not be prepared, and the impact topic of wetlands has been dismissed.

Floodplains

Executive Order 11988 *Floodplain Management* requires all federal agencies to avoid construction within the 100-year floodplain unless no other practical alternative exists. Under the NPS *2006 Management Policies* and Director's Order 77-2 *Floodplain Management* strive to preserve floodplain values and minimize hazardous floodplain conditions. According to Director's Order 77-2 *Floodplain Management*, certain construction within a 100-year floodplain requires preparation of a Statement of Findings for floodplains. This proposal does not include construction within a 100-year floodplain. Therefore a Statement of Findings for floodplains would not be prepared, and the topic of floodplains has been dismissed.

Paleontological Resources

In accordance with NPS *2006 Management Policies*, paleontological resources (fossils), including both organic and mineralized remains in body or trace form, would be protected, preserved, and managed for public education, interpretation, and scientific research (NPS 2006). Few paleontological resources

have been identified at CAGR and in all instances these paleontological findings have been found within a cultural context. For example, a fragment of petrified wood was found by Jesse Walter Fewkes during his excavation of Compound B. This fragment was identified as part of an archeological assemblage, which was found inside a room that dates to the Classic Period of Hohokam occupation (Fewkes, 1913). Since no paleontological resources have been identified within CAGR that are not associated with cultural assemblages, this topic has been dismissed from further assessment.

Ethnographic Resources

Per NPS Director's Order 28 *Cultural Resource Management*, ethnographic resources are defined as any site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it. According to DO-28 and Executive Order 13007 on sacred sites, the National Park Service must preserve and protect ethnographic resources.

CAGR is considered a Sacred Site to some local tribes, and CAGR has consulted with the six tribes that have documented cultural associations to CAGR resources numerous times. It has been noted that dogs are sacred to some cultures. No dogs would be eliminated under the proposed action. Currently, when feral dogs enter the park and pose a potential threat to public safety, Pinal County Animal Control is called to remove them. Round tailed ground squirrels may be of ethnographic interest to some tribes. While the proposed action would treat some squirrels, this species would not be eliminated from the monument. The impacts to ethnographic resources are predicted to be minor, and therefore this topic has not been analyzed in detail.

Air Quality

The Clean Air Act of 1963 (42 U.S.C. 7401 *et seq.*) was established to promote the public health and welfare by protecting and enhancing the nation's air quality. The act establishes specific programs that provide special protection for air resources and air quality related values associated with National Park Service units. Section 118 of the Clean Air Act requires a park unit to meet all federal, state, and local air pollution standards. All monuments are designated as a Class II air quality area under the Clean Air Act. A Class II designation indicates the maximum allowable increase in concentrations of pollutants over baseline concentrations of sulfur dioxide and particulate matter as specified in Section 163 of the Clean Air Act. Further, the Clean Air Act provides that the federal land manager has an affirmative responsibility to protect air quality related values (including visibility, plants, animals, soils, water quality, cultural resources, and visitor health) from adverse pollution impacts (EPA 2000).

There is the potential to have negligible to minor, short-term, localized impacts to air quality from the use of chemical treatments on pest species such as bees and wasps. Chemical treatments would be conducted following all legal requirements at both the state and national levels. Since these impacts are expected to dissipate rapidly, this topic is not analyzed in detail.

Soundscape Management

In accordance with 2006 *Management Policies* and Director's Order 47 *Sound Preservation and Noise Management*, an important component of the National Park Service mission is the preservation of natural soundscapes associated with national park units (NPS 2000). Natural soundscapes exist in the absence of human-caused sound. The natural ambient soundscape is the aggregate of all the natural sounds that occur in park units, together with the physical capacity for transmitting natural sounds. Natural sounds occur within and beyond the range of sounds that humans can perceive and can be transmitted through air, water, or solid materials. The frequencies, magnitudes, and durations of human-caused sound considered acceptable varies among National Park Service units and throughout each park unit, being generally greater in developed areas and less in undeveloped areas.

There may be negligible to minor sound issues during treatment implementation, such as motor noise from spray equipment. However, the noise would be short-term and localized. Therefore, the topic of soundscape management was dismissed.

Lightscape Management

In accordance with *2006 Management Policies*, the National Park Service strives to preserve natural ambient landscapes, which are natural resources and values that exist in the absence of human caused light (NPS 2000). CAGR strives to limit the use of artificial outdoor lighting to that which is necessary for basic safety and security requirements. The monument strives to ensure that all outdoor lighting is shielded to the maximum extent possible, to keep light on the intended subject and out of the night sky. The visitor center and the existing administration building are the primary sources of lights in the monuments. Lights may also serve to attract some pest species such as invertebrates. Light sources are addressed as part of pest prevention techniques included in the reports that are referenced as attachments to this EA. All lighting recommendations pose a beneficial and minor impact. Therefore, we have dismissed this topic from further analysis.

Socioeconomics

The proposed action would neither change local and regional land use nor appreciably impact local businesses or other agencies. Implementation of the proposed action could provide a negligible impact to the economies of nearby Coolidge and Florence, Arizona. There could be a minimal increase in employment opportunities and revenue generated from this project. Any increase in workforce and revenue, however, would be temporary and negligible. Because the impacts to the socioeconomic environment would be negligible, this topic has been dismissed.

Prime and Unique Farmlands

The Farmland Protection Policy Act of 1981, as amended, requires federal agencies to consider adverse effects to prime and unique farmlands that would result in the conversion of these lands to non-agricultural uses. Prime or unique farmland is classified by the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS), and is defined as soil that particularly produces general crops such as common foods, forage, fiber, and oil seed; unique farmland produces specialty crops such as fruits, vegetables, and nuts. According to the NRCS, the project area does not contain prime or unique farmlands (NRCS 2003). Therefore, the topic of prime and unique farmlands has been dismissed.

Indian Trust Resources

Secretarial Order 3175 requires that any anticipated impacts to Indian trust resources from a proposed project or action by Department of Interior agencies be explicitly addressed in environmental documents. The federal Indian trust responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native tribes.

There are no Indian trust resources within CAGR. The lands comprising the monuments are not held in trust by the Secretary of the Interior for the benefit of Indians due to their status as Indians. Therefore, the project would have negligible effects on Indian trust resources, and this topic was dismissed as an impact topic.

Environmental Justice

Executive Order 12898 *General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* requires all federal agencies to incorporate environmental justice into their mission by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. The proposed action could have negligible to minor impacts on health and environmental

effects, but such impacts would not be disproportionate to minorities or low-income populations or communities. Therefore, environmental justice has been dismissed as an impact topic in this document.

Vegetation

In accordance with the *2006 Management Policies*, NPS strives to maintain all components and processes of naturally evolving monument ecosystems, including the natural abundance, diversity, and ecological integrity of plants (NPS 2006). When populations of some pest species, such as the round tailed ground squirrel, reach high levels they consume much of the vegetation in the vicinity of their burrows. Because the highest density of burrows is adjacent to the visitor center and administrative buildings, much of the vegetation consists of ornamental plantings and is maintained through irrigation. These plants serve as an artificial food source that attracts pest species. Mechanical treatment methods such as caging of ornamental plants within high visitor use areas are included within both alternatives. However, impacts to vegetation are minor, and localized. Such impacts are limited to the artificially planted and maintained landscape materials in high visitor use areas. Any potential impacts to vegetation outside of ornamental plantings in high visitor use areas have already been analyzed in the *Environmental Assessment and Invasive Plant Management Plan for Tonto and Casa Grande Ruins National Monuments* dated December, 2007.

Historic Structures

The National Park Service, as steward of many of America's most important cultural resources, is charged to preserve historic properties for the enjoyment of present and future generations. According to the National Park Service's *2006 Management Policies and Director's Order-28 Cultural Resource Management*, management decisions and activities throughout the National Park System must reflect awareness of the irreplaceable nature of these resources (NPS 2006). The National Park Service protects and manages cultural resources in its custody through effective research, planning, and stewardship and in accordance with these policies and guidelines. Historic structures are a component of the cultural resources that are protected and preserved at CAGR.

There are 18 historic structures at the monument that are identified on the List of Classified Structures. This list includes the Visitor Center, office buildings, staff housing, maintenance facilities, the Ruins Shelter, and three archeological sites that are open to the viewing public. Under current management, park staff conducts routine monitoring for pest species and/or damage within all of these structures. Termites and other pests are treated as necessary using a categorical exclusion, and all pesticide treatments are approved through the NPS PUPS system prior to any application of insecticide.

Pests that are most common in the historic structures include mice, rats, roaches, silverfish, spiders, and flies. Monitoring for pest species is done on a routine basis and treatments are conducted on an as-needed basis.

Installation of any mechanical exclusionary devices that are not specifically identified in this document or in its referenced attachments must undergo full and separate analysis and interdisciplinary review in order to comply with the National Historic Preservation Act. Thus, the topic of Historic Structures has not been retained for further analysis in this document.

Cultural Landscapes

According to the National Park Service's *Director's Order-28 Cultural Resource Management Guideline*, a cultural landscape is a reflection of human adaptation and use of natural resources, and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. Research and evaluation of various cultural landscape components at CAGR are currently being addressed through a study conducted by the University of Arizona and the NPS. All proposed treatments are designed to protect pre-historic

structures, historic structures, historic landscape features, archeological remains, and unexcavated artifacts. Recent modifications (since 2004) to the ornamental landscape within high visitor use areas have been made under separate compliance documents. These changes are considered to pose a negligible to minor impact. The purposes of these changes were to prevent pest infestations by reducing suitable habitat for pests and to increase non-burrowing predators. Examples of these changes include the installation of drip-irrigation systems, covering the soil surface with gravel, caging plants, and erection of raptor poles.

Any landscape changes that are not specifically described in this analysis or its attached documentation would need to undergo additional, interdisciplinary review in order to comply with the National Historic Preservation Act. Neither of the proposed alternatives would adversely impact the designation of a cultural landscape at CAGR, and potential impacts to the cultural landscape posed by these alternatives would be negligible. Thus, this topic has been dismissed from further analysis.

Park Operations

Park operations describes the day to day management and operation of the park. Routine IPM inspections are conducted and preventative measures are consistently implemented, thus reducing the impacts from pest species and reducing staff time spent on pest issues. Regular inspections of museum collections, archeological sites, and high visitor use areas are conducted. Staff fills active burrows in areas of high visitor use to improve visitor safety, and removes nesting materials from archeological features within the Great House. While integrated pest management is an important function for the resources staff of CAGR, the overall impact to park operations is minor. Therefore, this impact topic has been dismissed from detailed analysis.

Visitor Use and Experience

According to 2006 *Management Policies*, the enjoyment of park resources and values is part of the fundamental purpose of all park units (NPS 2006). NPS is committed to providing appropriate, high quality opportunities for visitors to enjoy the parks, and would maintain within the parks an atmosphere that is open, inviting, and accessible to every segment of society. Further, the National Park Service provides opportunities for forms of enjoyment that are uniquely suited and appropriate to the superlative natural and cultural resources found in the parks.

There are a number of pest species that infrequently detract from *Visitor Use* and *Visitor Experience*. On occasion, portions of the monument are closed to visitors due for fear of bee swarms, rattlesnakes, and feral dogs. Some visitors have been bitten by ants near trash cans. Round-tailed ground squirrels are popular with visitors who often try to feed these wild animals in spite of posted signage that cautions them against this practice. Ground squirrels form burrows in public areas. These burrows pose a potential tripping hazard. Bees, rattlesnakes, feral dogs, ants, and squirrels all pose risks to visitors and these concerns are addressed under the Human Health and Safety section of this EA.

There are a number of exclusionary devices in the Casa Grande structure to prevent birds from roosting and nesting in sensitive areas of the structure. These devices are designed to be as non-obtrusive as possible. While these devices are effective at reducing pest damage to cultural resources, their presence may distract visitors from viewing the Casa Grande House in its natural state. Bird feces are visible on the walls and may detract from some visitor's experience.

Any modifications to the ornamental landscaping by using non-native vegetation within high visitor use areas may alter visitors understanding of what is and isn't natural. These impacts can be mitigated in part by explaining these changes in interpretive tours and signage. Visitor Use and Experience is impacted by the presence of pest species that sometimes cause portions of the monument to be closed to visitors, and through any modifications to the sites or natural landscape. Closures are infrequent and last only for a short time until the pest species can be removed. Modifications to the visual resources

and interpretive opportunities can be mitigated in part by explaining the modifications and changes to the visitor through interpretive tours and signs. Overall, impacts to visitor use and experience are considered to be minor and this topic is not analyzed in detail.

ACTIONS COMMON TO ALL ALTERNATIVES

Injury Levels and Action Thresholds:

In accordance with the specific management needs at CAGR, integrated pest management zones have been established. (See Appendix C, IPM Zone Map.) The establishments of these zones are based primarily on current land use, human health, and safety concerns. These zones were identified in 2005 and are a crucial component of both alternatives. An inventory of species within the current boundaries of CAGR was completed in 2006 by the Southwest Biological Science Center. Historical research and five years of monitoring have identified 25 species of animals as potential pest species within the monument. Action thresholds have been established for each of these potential pest species within each IPM Management Zone. Detail regarding species identification, habitat, behavior, and preventative treatments are included in Currie 2009. Casa Grande Ruins National Monument Integrated Pest Management Action Plan 2009.

IPM Management Zones have been delineated based on the following priorities: 1) ensuring the health and safety of staff and visitors, 2) cultural resource protection, 3) natural resource protection, and 4) current conditions including the density of burrows. Additional detail regarding the management of specific pest species within each zone is included in Currie, 2009. These zones and treatments are designed to maximize protection of human health and safety and cultural resources while also providing the flexibility to adjust the timing and frequency of the most effective treatment(s) to get the most efficient results on a case-by-case basis. The following types of treatments are used in each alternative: mechanical, chemical, biological, and cultural.

Descriptions of low-risk pest management methods of museum and other pests potentially present in CAGR structures, displays and landscapes are provided in Currie, 2009. The Monument's main pest concerns are round-tailed ground squirrels, mice, rabbits, hares, and birds. Potential pests such as ants, bats, coyotes, feral dogs, snakes, spiders, termites, bees, flies, crickets, and cockroaches that impact human and/or resource health are also addressed as Integrated Pest Management issues. Preventive methods such as exclusion, sanitation and habitat modification are described, as well as direct actions such as trapping and the use of directed pesticide applications. Inspection and monitoring of pest populations and contributing conditions would determine the extent of pest presence and direct pest management actions.

Treatment Alternatives:

The treatment alternatives would be implemented only when public health and safety and sensitive resources are threatened as prescribed by this plan. When the pest population increases to high levels that could cause devastating effects, then treatment alternatives would be applied; refer to Currie, 2009, for action thresholds. Lethal methods of pest eradication will only be used when non-lethal methods are not effective in meeting the management objectives. Employee and public education will be used as a preventative measure to reduce the use of other treatment alternatives.

Approvals, Responsibilities, and Treatment:

It is essential for all operations to support human health and safety, while also ensuring the preservation and protection of resources. The integrated pest management (IPM) program has similar responsibilities and should closely interact with all personnel. Any use of pesticides at CAGR would be in accordance with service-wide policies as found in NPS-77. All pesticides used would be applied by or

under the direct supervision of a State of Arizona Office of Pest Management Pesticide Applicator License. All pesticides used on the site by residents, contractors, special use permittees, and/or non-NPS personnel would conform to NPS policies and guidelines. The use of any pesticide must be approved through the NPS IPM Pesticide Use Proposal System before it may be used.

All treatments that have been identified in the following alternatives are part of a comprehensive, integrated pest management plan. This plan relies on internal approvals by the IPM Team and permits acquired through the Pesticide Use Proposal System (PUPS). No pesticides or herbicides may be applied without obtaining prior approval at the regional and/or national level through PUPS. All actions identified within Alternative I and Alternative II are consistent with previous plans such as the Integrated Pest Management Plan drafted by Gerry Hoddenbach in 1997 and the updated Integrated Pest Management Action Plan provided by the International Pest Management Institute in 2009. Most CAGR staff would be involved in pest management activities at one time or another. To make the IPM program most effective, the entire staff (and several non-NPS persons) should participate as a member of the pest problem-solving team. Attachment F (Currie Report) identifies specific roles and responsibilities for each member of the IPM Team. Included on this IPM team are the following members of the monument staff: Superintendent, Chief of Resource Management/Archeologist, Facility Management Supervisor, Chief Ranger, Curator, IPM Coordinator, and the Biological Science Specialist. Additional members of this team include the Intermountain Regional IPM Coordinator, SOAR Ecologist, consulting Biologists, as well as the National IPM Coordinator, IMR Historical Architect, IMR Historical Landscape Architect, and additional natural resource consultants as needed on a case by case basis.

Monitoring, Adaptation, and Education:

The key to successful implementation of any IPM planning document is adaptive management. Integrated pest management calls for the use of a number of different treatment methods to effectively deal with the pest species, such as the use of mechanical, chemical and biological treatments. Adaptive management means that staff would monitor the pest populations (i.e. numbers, locations, and effectiveness of treatments) and allow for flexibility in adjusting our integrated treatments to respond to changing conditions. Adjustments may include changing the preferred treatment method, treatment location, timing or frequency of treatments to effectively deal with the pest species, or the need to treat new pest species not currently known to occur in the monument. It also allows for the use of new treatment methods or materials that may become available and are better suited to a situation than those currently recognized.

For the purposes of IPM at CAGR, adaptive management includes the following:

- Treatments of pest species that may become established but which are not currently identified on the species list and/or are not known to occur in the park.
- The use of approved pesticides that may not be specifically listed in the proposed action but are approved for use by NPS and APHIS and have similar environmental effects to pesticides analyzed in this assessment.
- If prescribed management fails to result in desired outcomes, alternative strategies would be developed in cooperation with APHIS, and management would be adapted until the desired conditions are achieved. New alternative strategies would be reviewed on a site-specific and case-by-case basis. If it is demonstrated through analysis that the environmental impacts of a new approach fall outside the impacts as disclosed in this document, then additional environmental and cultural analysis would be undertaken under NEPA and §106.
- Timing of treatments may be adjusted to allow for maximum effectiveness, protection of burrowing owl populations, and to minimize the release of pesticides.

Through continued monitoring, adaptive management, and education, pest management within CAGR would be conducted in a proactive and responsible manner. This approach is interdisciplinary and uses a full range of available methods including education, prevention, mechanical methods, cultural

methods, biological methods, chemical methods, and adaptive land management. As such, the availability and use of specific pesticide formulations may change over time, but the methods set forth in this document and following attachments identify common pest problems at CAGR, provide a quick reference for the biology and behavior of common pest species, outline ongoing monitoring practices and propose additional research, set forth monument specific mechanisms for implementing NPS policies, identify NPS roles and responsibilities for permitting and review, and define the monument-specific criteria by which all future IPM treatment decisions would be made. Additionally, this Environmental Assessment describes all treatments currently employed at CAGR as Alternative I, and identifies rodenticide treatments that require additional environmental assessment in accordance with NEPA within Alternative II.

Alternative I: Current Management – Mechanical, cultural, and biological treatments with minimal use of PUPS approved pesticide treatments for invertebrate pest species would be used to manage pests at CAGR.

This alternative implements the use of mechanical treatments for all pest species, and minimal use of chemicals to manage invertebrate species. This alternative restricts techniques primarily to the use of mechanical treatments for the management of vertebrate pests. (See appendix A for more detail on approved current management practices.) Chemical treatments for invertebrate species posing a risk to human health and safety, or to historic structures are treated with pesticides using the Categorical Exclusion process. Potentially controversial techniques such as chemical treatments of vertebrates (use of rodenticides) are not permitted under this alternative.

Mechanical Treatments:

Mechanical treatments are defined as methods using tools or appurtenances to reduce, remove or prevent pest species from specific areas. These treatment methods are generally used to manage pest species such as mice in buildings, rodents, bats and pigeons in the Great House. Snap trapping of individual pest species of rodents within structures and shooting of persistent pests is included in this alternative. Filling of burrows with sterilized soil will reduce the trip or fall hazard within public areas and archeological sites. Caging of plants in visitor use areas also serve as mechanical deterrents that limit access to animals that would otherwise use ornamental plants as a food source.

Construction of exclusionary devices in archeological and historic buildings is also done as a pest prevention measure. Deterrent treatments also include regular removal of nesting material from structural cracks and archeological features within all visitor use areas and sensitive resources. Access to nesting and roosting cavities would be reduced by installation of appropriate preservation treatments. These treatments are designed to help reduce the need for pesticides. However, it should be noted that APHIS has advised CAGR that the use of flashing lights and ultrasonic noise are only considered helpful when combined with other treatment methods that have consequences to the animals such as trapping, shooting, pesticide treatments, and predators. When non-lethal deterrents such as noise, light devices, spikes, flat ribbon shock devices and other IPM Team approved deterrents are not effective, shooting of persistent individuals by USDA-APHIS has been approved by the IPM team.

Construction of small, removable, visual obstructions to discourage movement of round-tailed ground squirrels in sensitive areas is included in this alternative as a method for managing rodent populations in the back country. These obstructions will be fully removable, reversible and pose no potential hazard to cultural resource preservation. Analysis has eliminated it as a feasible alternative for use within visitor use areas due to the potential of this method to create an additional trip and fall hazard.

Cultural treatments:

Cultural treatments are defined as providing stress or control of pest species by manipulating the current habitat of those species. Removal of manmade food sources from the landscaped public areas

is included in this alternative as a cultural treatment. Seed pods and cacti fruit are removed from visitor use areas and sensitive resources to reduce the food source for pest species, such as the round-tailed ground squirrel. Drip irrigation systems are installed in landscaped areas where possible to reduce the water available to pest species. Visual and sound treatments are being implemented as additional deterrents in residential, public, and administrative areas. Improved visitor education would be provided to reduce feeding of squirrels. Sanitation practices in all building including historic buildings are used to prevent the attraction of pest species.

Biological Treatments:

Biological treatments mean using other flora or faunal species to direct prey upon or compete with pest species. Many bird species become habituated to certain places, meaning they get used to using the same areas such as the Great House or ruins shelter for roosting and nesting. Pigeons, House Finches, and European Starlings are the most destructive bird pests in the Great House and they have become habituated to these habitats. Mechanical and biological deterrents are currently used to eliminate habituated birds.

CAGR actively encourages the presence of raptor predators such as hawks and falcons to reduce prey populations such as pigeons and rodents. Improved habitat has been established to encourage predatory species that prey upon those pest populations that monitoring has identified as a threat to park management objectives. Trained and domesticated raptors may be used to prey upon or stress pest species to the point that they may vacate visitor use area and areas containing sensitive resources. Biological treatments also include the creation and installation of artificial habitats, adjacent to the archeological resource that is being impacted and relocation of pest individuals to that artificial habitat. These treatments will increase the predator species within the park and promote more natural processes.

Chemical Treatments:

Chemical treatments are defined as using pesticides to stress, repel or kill pest species. Lethal pesticide treatments will be restricted to invertebrate pests. Limited, non-lethal pest deterrents that use smell and taste are also included in this current management alternative (see Currie, 2009). Smell and taste deterrents will be used to prevent pest species such as rodents and lagomorphs from damaging resources. Two types of deterrents are a spray and cayenne pepper. When possible, soapy water is used as an insecticide and repellent but additional pesticides are approved through the Pesticide Use Permitting System (PUPS) prior to implementation. There is a separate environmental analysis for herbicides documented in Environmental Assessment and Invasive Plant Management Plan (NPS 2007) and therefore will not be assessed in this document.

Alternative II: PREFERRED ALTERNATIVE - Current Management plus PUPS approved pesticide Zinc Phosphide and Immunocontraceptive treatments for the management of rodents and lagomorphs.

The preferred alternative includes all aspects of current management that were identified in Alternative I, plus several treatments that have been evaluated to manage and treat small vertebrates, including rodent populations. All of the mechanical, cultural, biological and limited chemical treatments that have been identified in Alternative I: the Current Management alternative is included in Alternative II: Preferred Alternative. All chemical treatments used to control vertebrate species under this alternative have effects that are less than or equal to the effects of specific chemical treatments that are disclosed here.

Chemical Treatments:

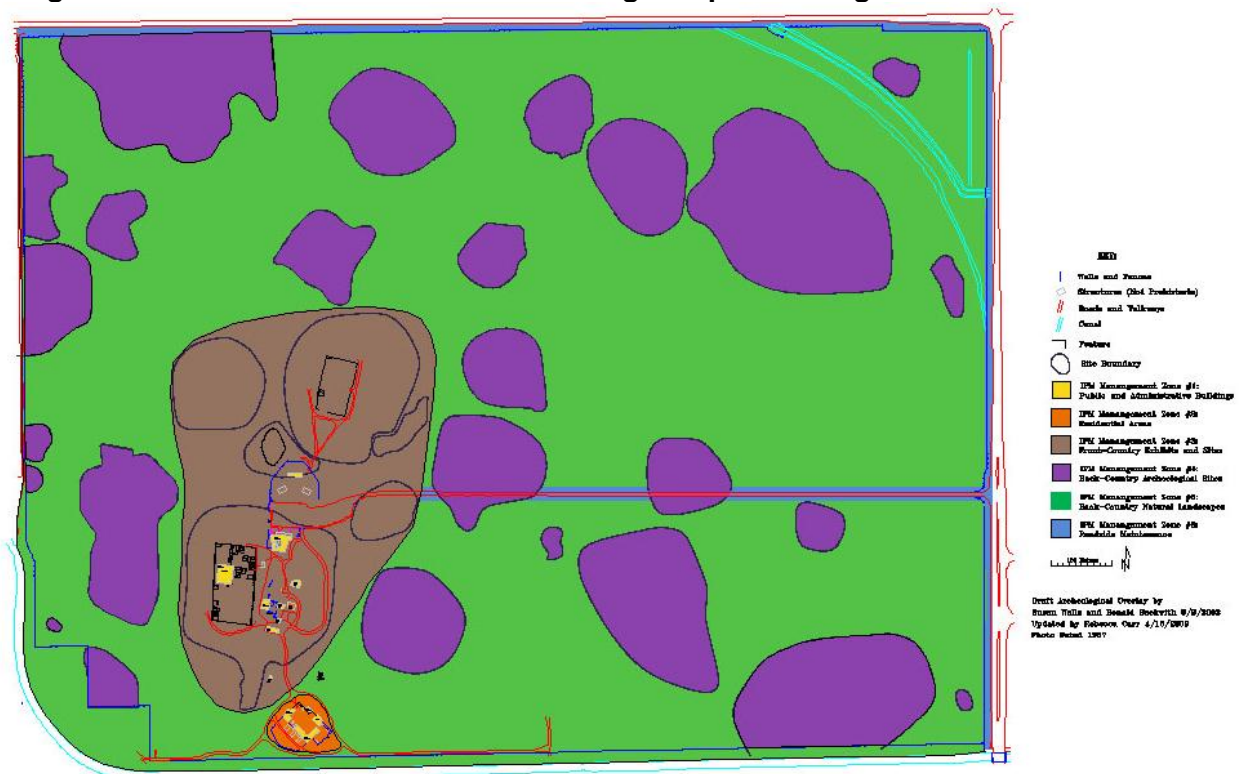
Chemical treatments that are included in Alternative II are the use of National Park Service approved rodenticide treatments. Various rodent and lagomorphs species are present throughout the monument including round tailed ground squirrels, mice, rats and rabbits. Rodents would not be eliminated from the monument but their density in high visitor use areas and on archeological sites would be reduced under this alternative and maintained at a level that is more consistent with resource protection needs.

Pesticides Identified for Use Under Alternative II:

- Lethal Pesticides – Pesticides (primarily zinc phosphide) would be applied to rolled oats according to label instructions only by licensed pesticide applicators. Pesticides would be mixed with bait and placed inside the openings of active burrows.
- Preventative Pesticides – Immunocontraceptives are a pesticide that is either ingested or injected (Fagerstone et al, 2008). This pesticide controls the reproduction of the animal by controlling their hormones or by their immune system. This type of pesticide has been effective in White-tailed deer, prairie dogs, and even some birds. For more information and details on this type of pesticide see Appendix B.
- Anesthesia – Products such as halothane are used to eliminate individual pest species posing risks to human health and safety, or impacts to natural and cultural resources. This treatment is used only on positively identified targets, such as bats in the vicinity of the Great House during visiting hours, and rats or other rodents burrowing in archeological resources.

Zones

Figure 2: Six zones have been identified to guide pest management decisions at CAGR



The following action thresholds have been approved by the CAGR IPM Team and are included in this alternative:

IPM Zone #1: Public & Administrative Buildings – Due to high levels of human use within areas of the park that are open to the visiting public, museum exhibits, and adjacent administrative buildings, the

action threshold for pesticide treatments to manage rodent populations is one rodent. No rodent activity would be tolerated within IPM Zone #1. However, since only interior spaces are covered within Zone #1, mechanical treatments are recommended as the primary method for eliminating pest rodents.

IPM Zone #2: Residential Areas - Damage to personal property within the residence areas is the trigger for IPM Team review of treatments including all treatment options noted within the current management alternative, zinc phosphide, and immunocontraceptives. Residents are not authorized to install any exclusionary devices that are not on their personal property, nor are they allowed to use pesticides outside of their residences without prior IPM Team review and approval. The action threshold for this zone would be determined by the comfort level of the residents, in consultation with the IPM Team, but even one rodent within the residential structures may trigger treatment.

IPM Zone #3: Front-Country Exhibits & Sites – This zone has high levels of human use and a high potential for resource damage. Historically and currently rodent burrow densities are high, exceeding 100 burrows/10m² in Compound A, Compound B, and the prehistoric ballcourt. All rodent species would be treated using a combination of mechanical, chemical, biological and cultural treatments. Pesticide treatments **would** be initiated when burrow densities exceed the action threshold of 20-40 burrows/10m² and/or when an interdisciplinary team determines there are unacceptable resource impacts. The objective for this area is no rodents or active burrows. Treatments may be implemented at any time of year when rodents are active and include: mechanical, chemical, biological and cultural. Damage to prehistoric archeological resources would trigger immediate mechanical treatment and discussion of follow up treatments using pesticides.

IPM Zone #4: Back-Country Archeological Sites – Scheduled assessments and annual archeological site maintenance treatments include mechanical treatments such as fill level maintenance. Pesticide treatments **may** be initiated when burrow densities exceed the action threshold of 20-40 burrows/10m² and/or when an interdisciplinary team determines there are unacceptable resource impacts. Prior approval from the IPM Team and annual PUPS permit are required for all pesticide treatments.

IPM Zone #5: Back-Country Natural Landscape – No rodenticide treatments are authorized for the management of rodent species within this management zone #5.

IPM Zone #6: Roadside Maintenance - No rodenticide treatments are authorized for the management of rodent species within management zone #6. However, it should be noted that other pesticide treatments may be applied within Zone #6 in accordance with the current management practices identified in Alternative I.

Zinc phosphide is the only currently approved rodenticide for use at CAGR but other pesticides with equal or less effect may be used under this EA to treat rodents and/or invertebrates so long as they have been approved by the CAGR IPM Team, a permit has been authorized for use of that pesticide through PUPS, and the pesticide applicator is licensed through the State of Arizona. Immunocontraceptives are a fertility control measure for rodents and would be included in alternative II as an option for further research and would be assessed to the extent that we are able to do so as part of the environmental consequences section of this EA. Immunocontraceptives would also require authorization through the PUPS system, approval from the CAGR IPM Team, and under the guidance of the NPS Wildlife Health Team, and any application of immunocontraceptives must be done by a pesticide applicator who is licensed by the State of Arizona.

The preferred alternative proposes an adaptive management approach by identifying different treatment methods, treatment areas and timing. The need to protect human health and safety and cultural resources in the intensive treatment area limits our ability to experiment on these sites. We support additional research, but it is outside the scope of this analysis. The literature available,

particularly on the effects of chemical pesticides, is thought to be sufficient to predict environmental effects.

It is anticipated that more problems would be effectively treated and restored under this alternative than under Alternative I because staff would have the option of selecting the most effective treatment(s) from a range of available management techniques and strategies. Many pest species are not effectively treated using mechanical and cultural methods. Since pest problems would be more effectively treated using a greater range of treatment techniques, there would be a greater opportunity to focus attention on preventative actions to reduce future resource impacts and reduce the need for future treatments.

Mitigation Measures Common to All Alternatives

All IPM decisions would follow existing NPS policies and procedures, including the prerequisite IPM questions and the 11 step process that are outlined within the Vanishing Treasures Sustainable Pest Management Guidelines for Cultural Resource Preservation (2006). A detailed report containing CAGR specific management guidelines, biological and behavioral data for the most common pest species at CAGR, and relevant management zones within the current boundaries of the monument are included in Currie, 2009. The information contained in this report by Currie has been compiled from data that has been generated over more than four years of animal impact monitoring. All recommendations are consistent with the current visitor uses that are specified in the Superintendents Compendium for CAGR (version 2008).

In accordance with NPS policies and guidelines, it is the goal of CAGR to use low-risk treatments that would accomplish the desired objectives. This would be done with short and long-term priorities. The short-term priorities would include maintaining all buildings as pest free; preventing damage to the Ruins and archeological sites; also maintaining high visitor use areas as free from pest hazards such as burrows, bees, venomous snakes, and spiders. Long-term priorities include continuing research on pest species while also continuing to install and maintain exclusionary devices. All pest issues and proposed treatments are reviewed by the interdisciplinary team prior to implementation. As specified in the "Roles and Responsibilities" section the attached "Implementation Plan for Integrated Pest Management" (Currie, 2009), pesticide use proposals are prepared by IPM Coordinators and are submitted to the Regional IPM Coordinator for review and approval. This submittal and approval process is mediated by the Pesticide Use Proposal System (PUPS).

Any use of pesticides at CAGR would be in accordance with service-wide policies identified earlier in this document. No pesticides would be applied without prior approval of an NPS authorized Pesticide Use Proposal. All pesticides that are used would be applied by or under the direct supervision of a trained pesticide applicator that is licensed by the State of Arizona Office of Pest Management. All pesticides used on the site by residents, contractors, special use permittee, agricultural issues, or non-NPS personnel would conform to NPS policies and guidelines, and would be approved before use. Inspection and monitoring of pest issues is combined with ongoing efforts to educate staff and members of the visiting public to ensure that pest issues and related health risks are addressed.

Best Management Practices:

Many facilities deal with pests in a reactive sense, treating for the pest after the infestation has occurred or with routine monthly sprays. Pests in a museum, library or archive environment can cause serious damage to highly valuable, and many times, irreplaceable materials or artifacts. IPM is proactive – work must be done to prevent pest activity rather than react to pest damage to artifacts. Damaged artifacts are not replaceable, and the extent of damage may preclude effective restoration.

An effective IPM plan provides a system of protection for the structure, collections, and staff from pests. The absence of pests reduces potential damage to museum objects and, therefore, reduces resources needed to repair and replace museum objects. Implementing a low-risk IPM approach excludes pests

from entering the structure, eliminates pests that may already be present, and implements management procedures before pest populations' increase to an unacceptable level. IPM provides an opportunity to provide a flexible and varied approach to managing the museum environment that proactively discourages pest infestation. The IPM approach provides efficient and environmentally conscious means to preserve archeological sites and museum collections.

Both Alternatives use this proactive approach. The specific actions included within each alternative have been addressed under the following subject headings: Mechanical, Cultural, Biological, and Chemical. All of the mechanical, cultural, biological, and chemical treatments that have been identified in Alternative I: Current Management is also included in Alternative II: Preferred Alternative. The primary difference between these two alternatives is the addition of pesticides to treat rodents and lagomorphs. Aside from limited testing of potential chemical treatments that were conducted by APHIS in 2005, no pesticide use has been approved nor implemented to control vertebrate pests within Alternative I: Current Management. The purpose of this EA is to analyze the effects of chemical treatments identified within Alternative II: Preferred Alternative.

Mitigation Measures Common to Both Alternatives

There are a number of mitigation measures common to both alternatives. Mitigation measures are related to a number of resource areas.

Cultural Resources

All treatments in close proximity to cultural resources (historic, prehistoric, and museum collections) would only be implemented under the supervision of a Cultural Resource Specialist to avoid the possibility of any adverse impacts. The "Cultural Resource Specialist" should be an archeologist meeting Secretary of The Interior Standards and Guidelines for Archeology and Historic Preservation. Should any treatment be determined to potentially affect cultural resources, site specific compliance with section 106 of the National Historic Preservation Act will be initiated and the appropriate pathway followed.

Should presently unidentified archeological resources be discovered during project implementation, work in that location would stop until the resources are properly recorded by an NPS archeologist and evaluated under National Register of Historic Places eligibility criteria in consultation with the Arizona State Historic Preservation Officer (AZ SHPO) and affiliated tribes as appropriate. If the resources are determined eligible, appropriate measures would be implemented either to avoid resource impacts or to mitigate disturbance. In compliance with the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA), NPS would also notify and consult affiliated tribal representatives for proper treatment of human remains, funerary, and sacred objects, should these be discovered. All workers would be informed of penalties for illegally collecting artifacts or intentionally damaging any archeological or historic property in the vicinity. Should any unusual treatment conditions or locations arise related to cultural resources, monument staff would contact the monument archeologist to determine how to proceed.

Job and Tool Use Safety

A job hazard analysis (JHA) that outlines job hazards and safety precautions will be developed for each project, and all project participants will receive safety training and will be required to use the appropriate personal protective equipment (PPE) for each associated task. The use of tools would follow procedures outlined in the JHA.

Visitor Experience

NPS staff will be available to provide educational and informational messages to any groups encountered during project implementation.

Special Status Species

There are two known special status species: the burrowing owl and Tucson shovel nose snake. There are a number of active owl burrows in the monument. Surveys for the Tucson shovel nose snake have not detected this species. The proposed alternatives are not expected to affect either of these species.

The following mitigation measures for special status species would be incorporated into both alternatives:

- The proposed treatments would include provisions for the discovery of previously unknown or undiscovered threatened, endangered, or special status species. These provisions require the cessation of project activities until monument staff evaluate the project's impact on the discovered species and conducts additional Section 7 consultation with the U.S. Fish and Wildlife Service if necessary.
- All project participants would be informed about special status species and what actions should occur if a special status species is encountered.

Label Directions

All chemical treatments would be approved for use through the PUPS system. All label directions will be followed and all chemical treatments would be applied by licensed applicators. APHIS may be contacted for assistance in the proper use of chemicals and/or to assist with their application.

• Pesticide Application

The monument adopted a policy of having a trained and certified applicator providing on site supervision during projects using pesticides. All pesticides proposed for use would have to be approved by NPS IPM staff through PUPS. The amount of pesticides applied, species treated, and treatment locations would be reported in PUPS following treatments. Project participants would understand and abide by the established Personal Protective Equipment (PPE) requirements and rules outlined on the product label. Rubber gloves, long sleeve shirts, bee hoods, and goggles may be required PPE for application of pesticides. Job hazard analyses (JHA) for pesticide application have already been prepared and would be reviewed frequently with all project participants.

All information and instructions on the pesticide label will be strictly followed. All pesticide containers will show the product label and will be leak and spill-resistant. All application equipment and chemicals will be stored in appropriate storage facilities. Material Safety Data Sheets (MSDS) will be maintained for all chemicals. The MSDS contains fire and explosive hazard data, environmental and disposal information, health hazard data, handling precautions, and first aid information. All participants will review the MSDS with the project leader and understand first aid instructions described on the MSDS. All pesticides and application equipment will be stored separately from food and personal items.

If the label instructions for the herbicide and application method recommend limiting exposure to humans and pets, the area will be closed during treatment. Treatments would occur when the least number of visitors would be impacted by the closure. Treatments that pose no risk to humans may be done at any time and may be interpreted for visitors. All pesticide mixing and loading of sprayer tanks will occur in designated staging areas.

If pest species occur in areas with archeological sites, the preferred method may be chemical control to avoid disturbance of the artifacts. Because it is not known how these chemicals will react with historic and prehistoric materials, when chemical treatments are used, they will be applied in the most precise manner possible, for instance pre-baiting active burrows to ensure all of the hot bait will be consumed. All mechanical treatments will be pre-approved by the monument archeologist when used in areas with known cultural resources will be subject to monitoring by the monument Archeologist or other Cultural Resource Specialist. Should any treatment be determined to potentially affect cultural resources, site specific compliance with section 106 of the National Historic Preservation Act will be initiated and the

appropriate pathway followed.

Alternatives Considered and Dismissed

Do Not Conduct any Pest Management at CAGR:

Integrated Pest Management is conducted as a regular component of NPS Management. It is the mission of the NPS "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as would leave them unimpaired for the enjoyment of future generations." (National Park Service Organic Act, 16 U.S.C.1.) ***Preservation and protection of the archeological ruins within CAGR is written into the enabling legislation that established it as a National Monument. Without any management of pest impacts within public areas and archeological sites, potential human health and safety issues would not be addressed and cultural resources would not be preserved in accordance with NPS legislative mandates.***

Previously identified as ***Alternative III, an alternative that included no use of chemical pesticides*** was very seriously considered by the Interdisciplinary Team and carried through until the later stages of this analysis before being dismissed. This alternative was dismissed because it was determined to be ineffective for long-term management of the pest issues at CAGR. Analysis determined this method to be impractical because staffing levels at CAGR are not sufficient to sustain this method of pest control, and many of the pest species at CAGR became habituated to non-lethal deterrents such as noise and lights. Many treatment methods that were developed as part of this alternative have already been incorporated into the preferred alternative including: improved landscaping practices, bird abatement flights with a trained raptor, improved raptor habitat, exclusionary treatments in the Great House, deterrent treatments (noise, lights and other forms of harassment), filling in burrows, removal of landscaping features that provide a potential food source for pests, improved sanitation, and improved visitor education. These methods were attempted in 2006 and 2007. They were found to be staff intensive and still were not sufficiently effective without supplementary aid from herbicide and pesticide treatments.

Pest Management without the Use of Pesticides:

Trapping and Avicide Treatments to Manage Pest Birds in the Great House:

Pigeons nesting in the Casa Grande Great House became habituated to the noise of a BirdXPeller Pro Bird Repeller after only one week and resumed nesting in the Great House. Pigeons commonly return to the same nesting locations year after year, creating a cyclic pattern that damages archeological resources. Once that cycle is broken, exclusionary devices have proven effective in keeping birds out of sensitive areas. Only lethal methods such as shooting have proven successful in breaking this cycle. Baiting and trapping of birds in the Great House proved ineffective during experimental treatments conducted during August of 2005. An experiment was conducted to determine if whole corn treated with DRC1339 Avicide would be effective as a method for pigeon control. Bird pests are not habituated to eating in the Great House and did not take the bait; however, rodent species discovered the bird bait and posed a greater threat to archeological site preservation. A substantial increase in rodent numbers within the Great House was observed the first day that pre-baiting began. This method was dismissed as ineffective. Thus, additional baiting, trapping, and avicide treatments for birds were eliminated from further analysis.

Trapping and Shooting of Rodent Pests:

The use of shooting and trapping for the control of round tailed ground squirrels was tested in the park by APHIS in August, 2005. Shooting squirrels is inefficient as squirrels learn to hide after the first couple of shots. Trapping is very time consuming with very limited success. Once the animals were

live trapped, there was no humane place to set them free without creating a new pest problem. APHIS biologists predict they would have less than a 25% success rate with trapping and shooting, and no chemical pesticides (personal communication Mark Lutman 10/21/05). Ongoing round tailed ground squirrel research by Monroe suggests that the trapping success would be even lower than that predicted by APHIS. During her research she attempted to study squirrels on paired plots –plots on areas of high squirrel density compared to plots on areas of low squirrel density (defined as areas where active burrows were present, and observations of 1-10 squirrels). After six weeks of pre-baiting and intensive trapping efforts, she was not able to trap a single squirrel on the low density plots. The limited success of trapping and shooting does not meet our management objectives of having 0-10 squirrels observed at any one time in areas of high priority treatment areas. It also does not meet management policy Director's Order #77-7 to be cost effective.

The use of zinc phosphide was highly successful and following one treatment, no squirrels were observed on the treatment area for several weeks. Pesticides such as zinc phosphide can be applied in one night, followed by two days of observations for carcasses and sick animals. Trapping with the current high densities could take up to a month in the early spring and another month in late summer. Based on 2006 cost estimates the use of pesticides to treat rodents is approximately \$2500. The cost of trapping is estimated to be at least \$17,000 and is not predicted to meet management objectives. It could cost even more that this as squirrel densities become lower and trapping becomes more difficult. Currently, no relocation area for squirrels is available. Considerable time and money would be spent on trapping before being euthanized in a carbon monoxide chamber.

Full Enclosure of the Great House:

Various plans have been proposed to fully enclose the Great House. Over the past century, these plans have included a proposal to enclose Compound A within a Geodesic Dome in the 1960s to talk in 2004 of reconstructing a roof based on archeologist's assumptions of what the Classic Period Hohokam structure looked like during its prehistoric use. Not enough physical evidence of the original roof exists to accurately reconstruct the original roof of the Great House and the process of reconstruction could damage irreplaceable, original features of this culturally significant building. Reconstruction is not a recommended method under the Secretary of the Interiors standards for Historic Preservation and would not likely be supported by resource specialists during the required consultations for compliance with section 106 of the National Historic Preservation Act. Fully enclosing the Great House may create changes in temperature, humidity, and ventilation that could potentially impact its structural integrity. Additionally, enclosure of the Great House would need additional study, planning, designing, and engineering that is currently not feasible within the scope of this planning effort. Should additional funding become available in the future, this alternative would be considered at that time. Enclosure of the Great House was reconsidered in 2005 as a means to reduce bird pest impacts without the aid of adequate study. At that time, the alternative was discussed and dismissed because without engineering and designs, no feasible option could be evaluated without potentially imposing an unacceptable impact to the preservation and interpretation of the Great House.

Inhalants such as Carbon Monoxide and Fumigant Cartridges to Eliminate Rodents:

Fumigant cartridges in rodent burrow or some forms of carbon monoxide produce heat and may cause other unacceptable impacts to buried archeological resources. The use of carbon monoxide in the form of dry ice to suffocate round tailed ground squirrels in their burrows without the use of additional pesticides was tested on a limited basis in 2004. The burrow systems are so extensive that the carbon monoxide escaped before accumulating in toxic levels.

Flooding of Rodent Burrows to reduce Round Tailed Ground Squirrel Populations:

Flooding burrows with water from a running garden hose was also tested in 2004. The burrows were so extensive that the water ran through and never accumulated in amounts sufficient to eliminate any squirrels or prevent the reuse of burrows.

Hardening of Archeological Sites:

In 2004, several alternatives focused on the “hardening” of archeological sites using various, irreversible treatments to fill in archeological features and structural cracks within the Great House and other above ground, prehistoric architecture. Some members of the interdisciplinary team suggested the use of expanding foam to fill structural cracks, and architectural features within the Great House to prevent animal access and reduce nesting areas for birds. Any treatment that is irreversible can potentially damage original archeological features. This would be in conflict with the Secretary of the Interior’s Standards for Historic Preservation, NPS-28, and the enabling legislation for CAGR. Additionally, the Great House expands and contracts due to changes in temperature and humidity. This structure has settled, over the past century, and is structurally stable. If the materials used to “harden” a site are indeed harder or stronger than those materials used to originally construct the site, environmental fluctuations could cause the harder material to expand and contract at a different rate than that of the original materials. This often results in damage to the original construction and can cause structural collapse if the effect is severe.

The injection of an impermeable material, such as injectable foam, could put added pressure at points of weakness within the Great House. It could prevent moisture from evaporating out of the earthen walls or even retain water against them, causing the walls to become unstable. Since limited data was available regarding the compatibility of injectable foam with the specific materials used to construct the Great House, this treatment was dismissed. The Great House was determined to be too culturally important risk any potential impacts to its structural integrity.

Removal of Rodents using a Commercially Contracted Vacuum Service:

High-suction ‘vacuums’ have been used to remove burrowing animals at other places. This was dismissed as a feasible alternative because no location is available for humane relocation of pest animals. Additionally, cultural artifacts could also be disturbed by using this method of trapping and relocation.

Netting to Exclude Birds from the Great House:

Various ways to install exclusionary netting were proposed. The use of exclusion netting was carried through the preliminary analysis phase and dismissed in the final stages of development of the preferred alternative for several reasons. No method could be identified to install netting that would completely eliminate bird access to the Great House without negatively impacting visitor access and use. Additional concerns were identified regarding the costs and personnel needs involved with installing, maintaining, and periodic replacement of the netting (as most netting would break down over time with UV and other environmental factors); and it may occasionally be a hazard for birds flying (crashing) into it. It would be possible to eliminate bird access to the ruins shelter with netting. However, concerns were raised that by excluding birds from the shelter, birds would simply perch within the Great House itself to enjoy the shade and cooler temperatures at a slightly lower elevation. In essence, we would be forcing them to roost on the Great House where their activity could result in greater impacts to this structure. Additionally, treatments tested by APHIS in 2005, found that the most effective method to remove pigeons from the Great House is to shoot them off of the girders in the ruins shelter. Exclusion netting of the shelter would prevent them from roosting here and eliminate shooting as a treatment method.

Many treatment methods that are used for current management of pests have also been incorporated into the preferred alternative including: improved landscaping practices, improved raptor habitat, exclusionary treatments in the Great House, deterrent treatments (noise, lights and other forms of harassment), filling in burrows, removing seed pods and other rodent food sources that are produced by ornamental landscaping in visitor use areas, and improved education for both staff and visitors alike. A survey of pest impacts to archeological resources was conducted in March of 2006 which identified that vertebrate damage is closely correlated to current, manmade land and water modifications that

have been made to the CAGR landscape. These treatments are designed to help reduce the need for chemical pesticides.

Environmentally Preferred Alternative

The environmentally preferred alternative is determined by applying the criteria suggested in the National Environmental Policy Act of 1969 (NEPA), which is guided by the Council on Environmental Quality (CEQ). The CEQ provides direction that “the environmentally preferable alternative is the alternative that will promote the national environmental policy as expressed in NEPA’s Section 101” (Forty Most Asked Questions Concerning Council on Environmental Quality’s National Environmental Policy Act Regulations, 1981).

Section 101 of the National Environmental Policy Act states that “...it is the continuing responsibility of the Federal Government to ...

- (1) fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
- (2) assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings;
- (3) attain the widest range of beneficial uses of the environment without degradations, risk to 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 which supports diversity and variety of individual choice;
- (5) achieve a balance between population and resource use which 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.”

Based on these national environmental policy goals, Alternative 2 is the environmentally preferable alternative for this project. A discussion of how each alternative relates to these goals follows:

Alternative I: Current Management – Mechanical, cultural, and biological treatments with minimal use of PUPS approved pesticide treatments for invertebrate pest species would be used to manage pests at CAGR.

This alternative seeks to meet environmental policy goals using primarily mechanical and cultural treatments, excluding the use of some IPM techniques to manage pest species, primarily chemicals. The most effective control technique for some species such as the rodents and lagomorphs is the integrated use of mechanical and chemical treatments. Chemical treatments are sometimes needed for problem rodents in the prehistoric archeological resources, and in areas of high visitor use.

This alternative limits the use of potentially controversial management techniques in recognition of their potential to damage resources and people if used improperly. However, implementation of this alternative will not alleviate current problems such as: cultural resource degradation, and risks to both visitor and staff health and safety due to active burrows in highly used areas. Ineffective rodent control in archeological sites may result in the loss of cultural resource values and nonrenewable original fabric. Lack of a proactive IPM program may adversely impact human health and safety, and increase facilities maintenance costs. Consequently, Alternative 1 does not satisfy the provisions of NEPA’s Section 101 as well as the preferred alternative.

Alternative II: PREFERRED ALTERNATIVE - *Current Management plus PUPS approved pesticide Zinc Phosphide and Immunocontraceptive treatments for the management of rodents and lagomorphs.*

This alternative provides the greatest flexibility in mitigating and responding to the unique and individual nature of all pest species problems that are present or may invade CAGR by using the full range of available IPM techniques, including those available now and yet to be shown as effective in the future. Using true integrated pest management strategies reduces dependence on one or few techniques to manage pest species, thereby lessening any repetitive and potentially cumulative adverse impacts of those same techniques to the safety, health and integrity of visitors, staff, and resources.

This alternative provides opportunities for selecting and tailoring individual or combined treatments against pest species, and thus should be most effective in managing the largest number of infestations. IPM treatments would be used in a proactive manner to prevent infestations, use the most effective treatment(s) methods available, and treat pest populations before they reach levels where human health and safety is at risk and park operations are impacted. This alternative will ultimately provide for human health and safety, positive visitor experiences, and the protection of cultural resources for future generations. This alternative would satisfy each of the provisions of the national environmental policy goals.

Environmentally Preferred Alternative

The environmentally preferable alternative is Alternative II because it augments the current management alternative (Alternative 1) by realizing the full range of national environmental policy goals as stated in Section 101 of the National Environmental Policy Act. Alternative 1 does not provide for comprehensive integrated pest management treatments, nor does it provide for long range prevention of pest populations. Pest populations (including such as rodents and termites) are expected to continue to be present and or re-invade suitable habitats causing on-going issues for human health and safety, cultural resource preservation, and facilities management. While Alternative 1 would result in the least amount of public controversy over perceived potential impact to wildlife and humans, it would not result in decreased risk to long-term human health and safety nor would it alleviate problems affecting positive visitor experience.

Table 1: Integrated Pest Management Plan Objectives

<i>Plan Objectives</i>	<i>Alternative I: Current Management – Mechanical, cultural, and biological treatments with minimal use of PUPS approved pesticide treatments for invertebrate pest species would be used to manage pests at CAGR.</i>	<i>Alternative II: PREFERRED ALTERNATIVE - Current Management plus PUPS approved pesticide Zinc Phosphide and Immunocontraceptive treatments for the management of rodents and lagomorphs.</i>
Reduce risks to human health and safety of park visitors, employees, and guests	While park management always strives to ensure human health and safety, this alternative will result in the greatest risks due to the presence of rodents in high visitor use areas.	Frequent monitoring of pest species populations, and implementation of the most effective treatments in a timely manner, results in the greatest reduction in risks to human health and safety.
Reduce damage to cultural and natural resources	Alternative 1 proposes to treat pest species as soon as possible after the impacts are identified.	Alternative 2 would better prevent impacts to cultural and natural resources by implementing a program that focuses on preventing infestations, particularly in high visitor

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		use areas.
Ensure that CAGR resources are protected from potential impairment	Under both alternatives, treatments would be implemented prior to conditions that would lead to impairment of park resources.	Under both alternatives, treatments would be implemented prior to conditions that would lead to impairment of park resources.
Enhance the visitor experience through the protection of natural and cultural resources	Mechanical, cultural and biological treatments would be applied when impacts to natural and cultural resources are detected. This alternative affords less protection to these resources compared to Alternative II.	This alternative applies a more proactive approach to the prevention and treatment of pest species. This alternative offers the full use of integrated pest management treatments to most effectively treat pest species and affords greater protection to natural and cultural resources.
Ensure that all IPM treatments are reversible and use compatible treatment materials	Both alternatives would ensure that IPM treatments are reversible and use compatible treatment materials.	Both alternatives would ensure that IPM treatments are reversible and use compatible treatment materials.
Prevent additional pest species or invasions from occurring	This alternative takes a less proactive approach to the prevention of pest species.	This alternative implements a more proactive monitoring program and prevention of pest species, when compared to Alternative I.

Table 2: Environmental Impact Summary by Alternative

<i>Impact Topics</i>	<i>Alternative I: Current Management – Mechanical, cultural, and biological treatments with minimal use of PUPS approved pesticide treatments for invertebrate pest species would be used to manage pests at CAGR.</i>	<i>Alternative II: PREFERRED ALTERNATIVE - Current Management plus PUPS approved pesticide Zinc Phosphide and Immunocontraceptive treatments for the management of rodents and lagomorphs.</i>
Soils	Implementation of this alternative would have a negligible effect on the soil resource. The minimal disturbance from implementing the treatments would be offset by filling burrows and reducing soil erosion.	There could be short term, minor impacts and adverse effects from the unlikely possibility that pesticides could accumulate in the soils. In the long term there would be moderate impacts with beneficial effects by effectively treating burrowing rodent species and reducing soil disturbance.
Archeological Resources	Impacts to archeological resources from the implementation of this alternative would be negligible. Few treatments would be applied in the vicinity of the archeological resources.	Removal of pests using the full range of tools would have beneficial short and long-term effects with minor impacts for the protection, stabilization, and context of archeological resources.
Museum Collections	Impacts are similar under both alternatives and the impacts are minor with beneficial effects.	Similar to Alternative I.

Impact Topics	<i>Alternative I: Current Management – Mechanical, cultural, and biological treatments with minimal use of PUPS approved pesticide treatments for invertebrate pest species would be used to manage pests at CAGR.</i>	<i>Alternative II: PREFERRED ALTERNATIVE - Current Management plus PUPS approved pesticide Zinc Phosphide and Immunocontraceptive treatments for the management of rodents and lagomorphs.</i>
Special Status Species and Wildlife	There could be short term, minor impacts with adverse effects from the possibility of treating a non-target species. Long term impacts are minor with beneficial effects from the enhancement of wildlife habitat by reducing pest species. Enhanced precautions are in place to prevent the elimination of any special status species.	This alternative would have the greatest long term beneficial effects to wildlife and special status species by eliminating pest species and consequently improving wildlife habitat. Due to the unlikely possibility of eliminating a non-target individual(s) there is a moderate impact with an adverse effect in the worst-case scenario in the short term.
Human Health and Safety	There would be minor impacts with beneficial effects to human health and safety in both the short and long term by eliminating pest species that pose a hazard to human health and safety. This alternative is less effective in treating burrowing animals and would have fewer benefits than Alternative II.	There would be beneficial effects to human health and safety with minor to moderate impacts. This alternative would most effectively treat burrowing rodents, thus reducing the risk of tripping and falling on collapsed burrows.

ENVIRONMENTAL CONSEQUENCES

This section analyzes the potential environmental consequences, or impacts, that would occur as a result of implementing the Integrated Pest Management Plan. It would analyze soils, archeological resources, special status species / wildlife, human health and safety, and museum collections. For each topic, impacts are defined in terms of type, context, intensity, duration, and timing. Direct, indirect, and cumulative effects are discussed in each impact topic. Definitions of intensity levels vary by impact topic, but the following definitions were applied for each impact topic.

Type:

- *Beneficial:* A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.
- *Adverse:* A change that moves the resource away from a desired condition or detracts from its appearance or condition.
- *Direct:* An effect that is caused by an action and occurs in the same time and place.
- *Indirect:* An effect that is caused by an action but is later in time or farther removed in distance, but is still reasonably foreseeable.

Context: This describes the area or location in which the impact would occur. It describes the setting in which an impact takes place (Are the effects site-specific, local, regional, or even broader?)

Duration:

- *Short-term:* An effect that within a short period of time (generally one or two years but no more than five years) would no longer be detectable as the resource is returned to its pre-disturbance condition or appearance; generally less than 5 years.
- *Long-term:* These impacts last beyond the treatment period, and the resources may not resume their pre-treatment conditions for a longer period of time following completion of the project. In the case of cultural resources, while damage that results in the loss of, or damage to historic structures may be physically repaired, that loss or damage to the buildings' integrity constitutes a permanent impairment of the resource.

Timing: This describes when the impact would occur. (Are the projects seasonally timed to avoid adverse effects?)

Intensity: This describes the degree, level, or strength of an impact. For this analysis, intensity has been categorized into negligible, minor, moderate, and major. Because definitions of intensity vary by resource topic, intensity definitions are provided separately for each impact topic analyzed in this Environmental Assessment.

Cumulative Effects:

The Council on Environmental Quality (CEQ) regulations, which guide implementation of the National Environmental Policy Act of 1969 (42 USC 4321 et seq.), require assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person

undertakes such other actions" (40 CFR 1508.7). Cumulative impacts are considered for both the Alternative I (Current Management) and Alternative II (Preferred Alternative).

Cumulative impacts were determined by combining the impacts of the Preferred Alternative with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other ongoing or reasonably foreseeable future projects within the monument and, if applicable, in the surrounding region. The geographic scope for this analysis includes elements within the monument's boundaries and areas adjacent to the monument. The temporal scope includes projects within a range of approximately ten years. Given this, the following actions have been identified for the purpose of conducting this cumulative effects analysis:

Agricultural Activities: Agricultural practices adjacent to CAGR lands have the potential to introduce new pest species. Flood irrigation of these fields provides a ready food and water source for existing pest species. Also, flood irrigation attracts ground squirrels and other ground dwellers to previously dry areas. Thus, artificial irrigation of ornamental plantings can increase pest populations in visitor use areas. Aerial applications of pesticides to adjacent agricultural fields pose a potential threat to monument resources as well. Such applications may drift onto monument lands, where they could potentially impact special status species.

Urbanization: Arizona continues to experience rapid population growth that is putting more and more pressure on natural areas. CAGR is now surrounded by commercial and residential development. Commercial development lines the eastern boundary of CAGR lands, residential development lines the southern boundary, and plans for residential development have already been approved at the north and southwest corner of the monument. Residential and commercial development along the monument boundaries may introduce additional pest species. As development encroaches at the monument boundaries, some animals move onto CAGR lands where they are less disturbed by human activities. The recently documented increase in coyote dens within archeological sites may be attributed to this urban encroachment.

Monument Infrastructural Construction: Construction and maintenance projects create disturbances that could, without proper precautions, enhance pest species. Ongoing landscape improvements at CAGR provide a source of food for pest species. Irrigation used to sustain the ornamental and education gardens in these landscaped areas provides a water source that also attracts and sustains pest populations. The theater expansion project would cause ground disturbance, and any additional plantings associated with this new construction could increase pest activity.

Recreation: 'Backcountry' access is currently limited at CAGR; however internal discussion have suggested the construction of a back-country trail or guided tours. The addition of human made features in the backcountry could attract pest species, ultimately increasing the potential threat to human health and safety for monument staff, visitors, and researchers. Recreational activities in the backcountry present human health and safety risks that may be attributed to pest activities. Increases in visitor to pest interactions, and many trip/fall hazards are a greater concern when backcountry access is provided to visitors. Any infrastructural improvements that include soil disturbance, increased irrigation, additional plantings, or paving may disturb and/or attract pest species into developed areas.

Impacts to Cultural Resources and National Historic Preservation Act Compliance:

Impacts to Cultural Resources and Section 106 of the National Historic Preservation Act:

In this Environmental Assessment, impacts to historic properties are described in terms of type, context, duration, and intensity, as described above, which is consistent with the regulations of the Council on Environmental Quality (CEQ) that implement the National Environmental Policy Act (NEPA).

This Environmental Assessment is intended, however, to comply with the requirements of both NEPA and §106 of the National Historic Preservation Act (NHPA). To achieve this, a §106 summary is included under the Preferred Alternative for each of the cultural resource topics carried forward. The topics of cultural landscapes, ethnographic resources, and museum collections were dismissed from further consideration because none were identified in the project area. The §106 Summary is intended to meet the requirements of §106 and is an assessment of the effect of the undertaking (implementation of the alternative) on cultural resources, based upon the criterion of effect and criteria of adverse effect found in the Advisory Council on Historic Preservation's regulations. Should any treatment be determined to potentially affect cultural resources, site specific compliance with section 106 of the National Historic Preservation Act will be initiated and the appropriate pathway followed.

Under the Advisory Council's regulations, a determination of either no historic properties affected, *adverse effect* or *no adverse effect* must be made for historic properties that are eligible for or listed on the National Register of Historic Places. A "no historic properties affected" determination is appropriate when the agency official finds that either there are no historic properties present or there are historic properties present but the undertaking will have no effect upon them as defined in § 800.16(i) as having no alterations to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register.

An *adverse effect* occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion in the National Register (e.g. diminishing the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association). *Adverse effects* also include reasonably foreseeable effects caused by the Preferred Alternative that would occur later in time; be farther removed in distance; or be cumulative (36 CFR Part 800.5, Assessment of Adverse Effects). A determination of *no adverse effect* means there is an effect, but the effect would not diminish in any way the characteristics of the cultural resource that qualify it for inclusion in the National Register of Historic Places.

In accordance with the Advisory Council's regulations implementing §106 of the NHPA (36 CFR Part 800, Protection of Historic Properties), impacts to historic properties for this project were identified and evaluated by (1) determining the area of potential effects; (2) identifying cultural resources present in the area of potential effects that were either listed in or eligible to be listed in the National Register of Historic Places; (3) applying the criteria of adverse effect to affected cultural resources either listed in or eligible to be listed in the National Register; and (4) considering ways to avoid, minimize, or mitigate adverse effects.

CEQ regulations and *NPS Conservation Planning, Environmental Impact Analysis and Decision-Making* (Director's Order #12) also call for a discussion of the appropriateness of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact (e.g. reducing the intensity of an impact from major to moderate or minor). Any resultant reduction in intensity of impact due to mitigation, however, is an estimate of the effectiveness of mitigation under NEPA only. It does not suggest that the level of effect as defined by §106 is similarly reduced. Although adverse effects under §106 may be mitigated, the effect remains adverse.

In order for a historic property to be listed in the National Register of Historic Places, it must meet one or more of the following criteria of significance: A) associated with events that have made a significant contribution to the broad patterns of our history; B) associated with the lives of persons significant in our past; C) embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic value, or represent a significant and distinguishable entity whose components may lack individual distinction; D) have yielded, or may be likely to yield, information important in prehistory or history. In addition, the historic property must possess integrity of location, design, setting, materials, workmanship, feeling, association (*National Register Bulletin, How to Apply the National Register Criteria for Evaluation*).

SOILS

Affected Environment

The monument is approximately one kilometer south of the Gila River, and since the construction of the Coolidge Dam the river flows only for brief periods following heavy sustained rains. The monument is situated in the Basin and Range Physiographic Province which is characterized by gently sloping valley floors surrounded by mountain ranges. The monument is in a valley bottom with nearly level topography. Quaternary and Tertiary alluvial deposits characterize the monument. Soil at the monument is classified as Coolidge Sandy Loam, with caliche deposits two to four feet below the surface. Observations indicate numerous areas of biological crusts on the soil surface. Soils are impacted by burrowing animals, many of which are considered pest species when burrowing within the known boundaries of archeological sites. Pest species may include: rodents, coyotes, foxes, feral dogs, and rabbits. Currently, the most extensive soil impacts at the monument are the result of burrowing by round-tailed ground squirrels that create an extensive network of burrow openings and tunnels, often in areas of high visitor use and within archeological sites. Burrowing within archeological sites causes associated soil erosion, and displacement of cultural deposits within the stratigraphic, archeological record. These impacts are considered to be unacceptable due to the high density of these burrows. A number of invertebrate and vertebrate species also create burrows, however, their burrows are much smaller and the density of burrows is so low that the impacts to soils and sites are negligible. Burrowing disrupts surface stability and biological soil crusts making the soil more susceptible to erosion, and it disrupts subsurface soil stratigraphy.

Methodology and Intensity Thresholds

Analyses of the potential intensity of impacts to soils were derived from the available soils information, field observations, and monument staff's past observations of the effects on soils from visitor use, and pest removal. Unless specifically noted in this analysis, both short-term and long-term impacts are the same. Thresholds for the intensity of an impact are defined as follows:

Table 2: Impact Intensities and Definitions - Soils

Impact Intensity	Intensity Definition
Negligible	Soils would not be affected or the effects to soils would be below or at the lower levels of detection. Any effects to soils would be slight and erosion would not be noticeable.
Minor	The effects to soils would be detectable. Effects to soil area, including soil disturbance and erosion, would be small and localized. Minimal soil loss would occur. Mitigation may be needed to offset adverse effects and would be relatively simple to implement and likely be successful.
Moderate	The effect on soils would be readily apparent and result in a change to the soil character over a relatively wide area, soil disturbance over a wide area, or erosion that extends beyond the project site and/or results in some soil loss. Mitigation measures would be necessary to offset adverse effects and likely be successful.
Major	The effect on soils would be readily apparent and substantially change the character of soils over a large area, and substantial erosion would occur resulting in a large soil loss. Mitigation measures to offset adverse effects would be needed, would be extensive, and their success could not be guaranteed.

Soil impacts would be considered short-term if the soils recover in less than three years and long-term if the recovery takes longer than three years.

Alternative I: Current Management – Mechanical, cultural, and biological treatments with minimal use of PUPS approved pesticide treatments for invertebrate pest species would be used to manage pests at CAGR

Impact Analysis:

Under this alternative the potential for continued soil disturbance is higher than under Alternative II. While this alternative would treat burrowing species using mechanical, cultural and biological methods, past experience has shown these methods to be much less effective than the use of chemical pesticides for the treatment of round-tailed ground squirrels that are the species that cause the most impact to the soil resource.

Mechanical: The mechanical methods for treating pest species would be filling burrows, snap traps, and exclusionary devices. Filling burrows would have a negligible impact because the effects would be low and would not increase erosion. The off-site soil which is brought from a reliable source is non-contaminated, devoid of seed and/or artifacts. Effects from lethal snap traps would have a negligible, localized and short term impact to the surface of the soil from walking to trap placement and removal. Digging for the application of termite treatments would have a minor impact but it would be short term and localized to areas adjacent to buildings. Exclusionary devices would have a negligible impact because caging plants with temporary small wire fences would be the only application affecting soil, and is a localized impact to the immediate soil surface area.

Chemical: Chemical treatments would apply limited amounts of pesticides on invertebrate species which would include soapy water, and taste and smell deterrents. Pesticides would have a negligible to minor impact because of the potential to leach into the soil is limited as they are seldom applied on or near the soil surface (excepting termite treatments). Pesticides would be applied primarily within buildings with limited use outdoors around the foundation of the buildings. Termite treatments would have a minor impact on soils because the digging and the application of the chemical causes localized disturbance around buildings. Soapy water would have a negligible impact because of the use of environmentally friendly soap. Taste and smell deterrents would be a negligible to minor impact because the least amount of chemical would be used in limited areas, thus reducing the potential to accumulate in the soil.

Biological: Biological treatments include the use of improved raptor habitat in order to encourage raptor presence in and near the monument, and the use of raptor flights to deter birds in the Great House. Soil impacts from the installation of poles and artificial habitats are negligible to minor as the disturbance is limited to the installation of few (3-5) strategically placed poles. This would have a beneficial impact to soils in the long term by reducing populations of burrowing pest species, such as round-tailed ground squirrels. Raptor flights would have negligible impacts to the soil surface from trainer movement.

Artificial habitat for predator species such as burrowing owls in non-archeological sites is another biological treatment. The short-term impacts would be moderate, adverse and localized as new burrows are created. Long-term the impacts are predicted to be minor and beneficial as the newly created habitats stabilize and help reduce impacts to soils in other areas; in particular it would reduce burrowing on sensitive archeological sites with erosive soils. Relocation of predator species such as snakes out of public would have negligible impacts to soils.

Cultural: The cultural methods for treating pest species would be removal of food sources, improved irrigation systems, education, sanitation practices, and visual and sound deterrents. Removal of food sources would have a negligible to minor impact on soil surface damage from walking and raking to remove the food sources in administrative areas. Irrigation systems would result in a minor impact in the short term due to soil disturbance for initial modification of the system. Long term impacts would be

negligible and result from periodic maintenance requirements. Visual and sound deterrents; education; and sanitation would have negligible impacts on the soil resource.

Cumulative Impacts

Agricultural activities and urban development adjacent to the monument result in a high level of soil disturbance. These activities displace some pest species that prefer the more natural habitats found in the monument such as round-tailed ground squirrels. This results in higher levels of soil disturbance in the monument. Monument activities such as the construction of the theater and backcountry trails would have a minor impact on the soil resource. When the impacts of this alternative are considered in the cumulative scenario, this alternative would have negligible short and long term effects to the soil resource.

Conclusion

While some of the actions identified in Alternative I have the potential to disrupt biological soil crusts that help protect the soil from erosion, the beneficial effects of some treatments (such as filling in burrows) would outweigh them. Impacts from implementing IPM treatments in Alternative I would be negligible. Cumulative effects of the alternative are negligible.

Alternative II: Proposed Action - Current Management plus PUPS approved Zinc Phosphide and Immunocontraceptive treatments for the management of rodents and lagomorphs.

Impact Analysis

Under this alternative, pest species would be controlled using mechanical, chemical, biological, and cultural methods plus the use of pesticide zinc phosphide and immunocontraceptive treatments on rodents and lagomorphs. These actions are described in detail in the Alternative II section above. The treatments would include all actions described in Alternative I: Current Management plus these additional treatments.

Mechanical: The mechanical treatments for Alternative II would be the same as those described in Alternative I.

Chemical: The chemical treatments would include pesticides for rodents and lagomorphs such as zinc phosphide and immunocontraceptive treatments. The impact from these treatments would be minor to moderate because of the potential for the chemicals to leach into the soil. For example, zinc phosphide would only have a minor potential to leach into the soil if not consumed because the chemical turns to phosphide gas in the stomachs of rodents (Cornell University 1993). According to the Environmental Protection Agency, "When applied to dry soil environments, zinc phosphide may be moderately persistent (.40% of applied remaining at 30 days post-treatment)." However, this is unlikely because the treated bait would be placed directly within the active burrows where it would be consumed by the target animals. There are no secondary effects to the soil after consumption of the immunocontraceptives (for more information, refer to Cornell University 1993). These chemicals would be applied by trained professionals to ensure proper application in accordance with labeling, State and Federal regulations. Any and all chemicals for this control would be minor to moderate because of the potential to leach into the soil but would be applied by trained professionals to reduce the potential negative effects. The chemicals would be a beneficial effect to resource conservation by reducing the rodent and lagomorphs populations in high productive years.

Biological: The biological treatments would be the same as in Alternative I.

Cultural: The cultural treatments would be the same as in Alternative I.

Cumulative Impacts

Cumulative impacts are expected to be similar those described in Alternative I.

Conclusion

In the short-term, there could be minor and adverse impacts in the localized treatment areas due to the potential risk for chemical accumulation in the soil. The long-term impacts are predicted to be moderate and beneficial as pests, such as round-tailed ground squirrels that cause soil disturbance, would be treated most effectively under this alternative resulting in less soil disturbance and reduced loss of soil biological crusts. Cumulative effects of the alternative are negligible.

ARCHEOLOGICAL RESOURCES

Affected Environment

CAGR preserves the well-known Great House, the only remaining structure of its kind. In addition to the Great House there are 60 additional archeological sites have been identified within the current boundaries of the monument. Components within these sites include trash middens, artifact scatters, earthen walls, borrow pits, and other unexcavated archeological features. While most sites date to the Classic Period of Hohokam Culture (AD 1250-1550), elements from the Colonial (AD 1100-1250) and Sedentary (AD 900-1100) periods have also been identified and mapped within CAGR. Archeological resources provide excellent harborage for pest species. However, pests pose a substantial threat to the preservation, scientific, and cultural value of these irreplaceable resources.

Methodology and Intensity Thresholds

Analyses of potential impacts to archeological resources were derived from the available scientific data, literature, and monument staff's past observations of the effects on archeological resources. Unless specifically noted in this analysis, both short-term and long-term impacts are the same. Thresholds of impact intensity are defined as follows:

Table 3: Impact Intensities and Definitions - Archeological Resources

Impact Intensity	Intensity Definition
Negligible	Impact is at the lowest levels of detection – not measurable and no perceptible consequences, either adverse or beneficial. For the purposes of Section 106, the determination of effect would be <i>No Historic Properties Affected</i> .
Minor	Adverse effect – IPM treatments that cause disturbance of a site(s) results in no loss of integrity. For the purposes of Section 106, the determination of effect would be <i>No Adverse Effect</i> . Beneficial effect – IPM treatments result in the maintenance and preservation of a site(s). For the purposes of Section 106, the determination of effect would be <i>No Adverse Effect</i> .
Moderate	Adverse effect – IPM treatments that cause disturbance of a site(s) results in a loss of integrity. For the purposes of Section 106, the determination of effect would be adverse effect. A memorandum of agreement is executed among NPS and applicable State Historic Preservation Officer and, if necessary, the Advisory Council on Historic Preservation in accordance with 36 CFR 800.6(b). The mitigation measures identified in the MOA reduce the intensity of impact under NEPA from major to moderate. Beneficial effect – IPM treatments result in the maintenance and preservation of a site(s). For the purposes of Section 106, the determination of effect would be <i>No Adverse Effect</i> .
Major	Adverse effect – IPM treatments that cause disturbance of a site(s) results in a loss of integrity. For the purposes of Section 106, the determination of effect would be adverse effect. A memorandum of agreement is executed among NPS and applicable State Historic Preservation Officer and, if necessary, the Advisory Council on Historic Preservation in accordance with 36 CFR 800.6(b). The mitigation measures identified in the MOA reduce the intensity of impact

	<p>under NEPA from major to moderate.</p> <p>Beneficial effect – IPM treatments result in the maintenance and preservation of a site(s). For the purposes of Section 106, the determination of effect would be <i>No Adverse Effect</i>.</p>
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Duration of all archeological resource impacts are considered to be long-term (permanent) because, even if the physical damage can be repaired, any damage to a site’s integrity, research value, and cultural value can never be replaced. Thus, damage to an archeological site cannot be adequately mitigated.

Alternative I: Current Management – Mechanical, cultural, and biological treatments with minimal use of PUPS approved pesticide treatments for invertebrate pest species would be used to manage pests at CAGR.

Impact Analysis

Adverse impacts to archeological resources are expected to be greatest under this alternative, primarily from rodents burrowing into the original materials of the Great House and other cultural resource sites, and disturbance of buried artifacts across the monument. Pest species cause the most damage by digging and burrowing into irreplaceable archeological resources. The soil on these archeological sites is relatively soft, which makes it easy to burrow into and these results in a loss of stratigraphic context within the archeological site. Impacts from small mammals have the potential to have moderate, adverse, direct, short and long term impacts to the original fabric of the cultural resources and by exposing buried artifacts. Some chemical treatments, such as the use of zinc phosphide, are not allowed under this alternative.

Mechanical: The mechanical methods for treating pest species would be filling burrows, snap traps, and exclusionary devices. Filling burrows would have a negligible impact because of the use of non-contaminated soil from a reliable source and the soil used would be of lower substrate which will reduce the potential to introduce off-site artifacts. Lethal snap traps would be a negligible impact because lethal snap traps would be placed in non-sensitive locations. Exclusionary devices would be a minor impact because of the potential to disturb the resources with small particles of original fabric scrapping off. Exclusionary devices are reversible and removable which reduces the negative effects. Ruins stabilization would be a minor impact because of the potential to introduce off-site artifacts but is highly unlikely due to the non-contaminated soil.

Chemical: The chemical methods would be limited pesticide use on invertebrate species which include pesticides, soapy water, and taste and smell deterrents. Pesticides would be negligible because not applied near archeological resources. Pesticides would be applied primarily within buildings with limited use outdoors around the foundation of the buildings. Soapy water would be a negligible impact because of the use of only environmentally friendly soap. Taste and smell deterrents would be a minor impact because of the potential to accumulate but used in localized areas and not within archeological resources.

Biological: The biological treatments would be predator species such as raptor encouragement and raptor flights. Raptor encouragement would be negligible to minor impact because construction of artificial habitats is limited to non-archeological sites or features within sites. This would be a beneficial impact in the long term to the archeological site by reducing the pest species. Raptor flights would be negligible because of the flights are conducted by a trainer but the potential for the raptors to scrape wings and/or defecate on the resources. The creation of artificial habitats would be conducted outside of the known boundaries of archeological sites and the relocation of predators would be encouraged. The construction of artificial habitats would be monitored throughout the construction for potential archeological sites not previously recorded. Since installation of these artificial habitats would not be located within known archeological sites and their purpose is to entice pest animals away from documented sites, the short and long-term impacts from these artificial burrows would be moderate, beneficial, and localized.

Cultural: The cultural methods for treating pest species would be removal of food sources, irrigation system, education, sanitation, and visual and sound deterrents. Removal of food sources would have minor and beneficial effects because it reduces pest species within archeological sites but does not negatively affect the archeological sites. Food is also prohibited in archeological sites which reduces the potential for pest species. Irrigation system would be a negligible impact because not applied in archeological sites. Visual and sound deterrents would be negligible impact because the sounds would be too low of vibrations to have any impact. Education would be negligible impact but beneficial effect by reducing pest issues. Sanitation would have a negligible impact but beneficial effect because of reducing the attractants for pest species.

Cumulative Impacts

Agricultural activities and urban development adjacent to the monument result in the loss of archeological resources. These activities displace some pest species that prefer the habitats found in the monument such as burrowing into the softer soils of archeological sites, nesting within the walls of the Great House, and roosting in the shade structure over the Great House. These factors may result in increased impacts to the archeological resources of the monument. Since the impacts of this alternative are negligible, they would have a negligible impact on the cumulative impacts to archeological resources.

Conclusion

Impacts for Alternative I would be negligible effects because the treatments would reduce the pest species but most of the treatments are conducted outside of the archeological sites. All treatments that are included in Alternative I: Current Management would have negligible short and long-term impacts to the archeological resources. Cumulative effects of the alternative are negligible.

Alternative II: Proposed Action - Current Management plus PUPS approved pesticide Zinc Phosphide and Immunocontraceptive treatments for the management of rodents and lagomorphs.

Impact Analysis

The beneficial impacts to archeological resources are greatest under this alternative as the most effective treatments would be applied in a proactive manner. This alternative also provides increased implementation of preventative measures, such as the use of immunocontraceptives.

Mechanical: The treatments would be the same as Alternative I.

Chemical: The chemical treatments would include pesticides for rodents and lagomorphs such as zinc phosphide and immunocontraceptive treatments. The adverse impact from these treatments would be minor because of the potential for the chemicals to leach onto the archeological resources. Zinc phosphide would only have a minor potential to leach into the soil if not consumed because the chemical turns to phosphide gas in the stomachs of rodents (Cornell University, 1993). The treated bait would be placed directly within the active burrows where it would be consumed by the target animals. There are no secondary effects to the archeological resources after consumption of the immunocontraceptives (for more information, refer to Cornell University 1993). These chemicals would be applied by trained professionals to help reduce any adverse effects. The chemicals would have a minor impact with beneficial effects by reducing the rodent and lagomorphs populations in high productive years which would protect the archeological resources.

Biological: The treatments would be the same as Alternative I.

Cultural: The treatments would be the same as Alternative I.

Cumulative Impacts

The cumulative impacts are the same for Alternative II as they are for alternative I.

Conclusion

The impacts are minor with beneficial effects for Alternative II. All effects are beneficial for the preservation and protection of archeological sites by reducing the adverse effects of burrowing and nesting pest species, archeological site disturbance and damage would be alleviated. This alternative reduces pest species while also providing enhanced. Cumulative effects of the alternative are negligible.

MUSEUM COLLECTIONS

Affected Environment

Museum collections are defined as objects that have been collected from their original location to serve as a resource for educational, research, or visitor enjoyment. Thus, any artifacts contained within archeological sites are not part of an NPS museum collection until they are collected and brought into a collections facility. The affected area for Museum Collections for CAGR includes museum facilities within the monument, for the purposes of this document. However, there is one collections facility within CAGR. The Visitor Center houses all collections that are viewed by the public.

Methodology and Intensity Thresholds

Analyses of the potential intensity of impacts to museum collections were derived from the available literature and monument staff's past observations of the effects on museum collections during past mitigation projects. Unless specifically noted in this analysis, both short-term and long-term impacts are the same. The thresholds of change for the intensity of an impact are defined as follows:

Table 4: Impact Intensities and Definitions – Museum Collections

Impact Intensity	Intensity Definition
Negligible	Impact is at the lowest levels of detection – barely measurable without any perceptible consequences, either adverse or beneficial. For the purposes of Section 106, the determination of effect would be no adverse effect.
Minor	Adverse effect – IPM treatment within the visitor center results in little, if any, loss of museum resources. Beneficial effect – IPM treatments result in the maintenance and preservation of museum resources.
Moderate	Adverse effect – IPM treatment within the visitor center results in a loss of museum resources. Beneficial effect – IPM treatments result in the preservation of museum collections.
Major	Adverse effect – IPM treatment within the visitor center results in complete loss of museum resources Beneficial effect – IPM treatments result in the preservation of museum collections.

Damages to Museum Resources are irreversible and cannot be recovered regardless of duration.

Alternative I: Current Management – Mechanical, cultural, and biological treatments with minimal use of PUPS approved pesticide treatments for invertebrate pest species would be used to manage pests at CAGR.

Impact Analysis

For museum collections, all actions and impacts are the same for both alternatives. Adverse impacts to museum collections can never be recovered. Rodents, insects, mold and mildew can cause irreversible damage to objects within the Museum Collections at CAGR.

Mechanical: The mechanical treatments used around Museum collection are exclusionary devices, snap-traps for rodents and sticky traps to monitor and catch insects. Exclusionary devices such as cases and boxes to enclose the collections would be minor impact, beneficial effects, and localized to the museum collections by reducing the pest populations. The snap and sticky traps in the short and long-term would be minor impact, beneficial effect, and localized to the museum collections by preventing and removing pest populations such as mice and dermestid beetles.

Chemical: The chemical treatments would be limited to invertebrate pest species within the museum. The chemical treatments would have a short term negligible to minor impact with adverse effects because of the potential for pesticides to come into contact with the museum collections. The chemical treatments would be a long term minor impact with beneficial effects by preventing infestations, reducing populations of pests and thereby protecting the museum collections. Soapy water would be used in cracks and crevices to prevent pest species and would be a negligible impact. Taste and smell deterrents would be a negligible impact by deterring pest species away from the building and used outside and along the edge of the building. Diatomaceous earth is a fine white powder that would be used in cracks and crevices to reduce pest species. This pesticide would be a negligible impact to the museum collections. No chemicals would be sprayed on or within the immediate vicinity of any museum collections.

Biological: There are no biological treatments that can be conducted in the museum.

Cultural: The cultural treatments would be education; sanitation; removal and prevention of food sources in and around the museum collections. The removal and prevention of food in and around museum collections is a minor impact and beneficial effect by reducing the attractants for pest species. Education is a negligible impact by informing the public that food attracts pest species into the museum. Sanitation is minor impact and beneficial effect because cleaning the museum would prevent and remove pest species within the museum collections.

Cumulative Impacts

Potential impacts to museum collections are limited to those collections housed at the monument. Consequently, activities taking place adjacent to the monument would not directly affect museum collections. The cumulative impacts of the alternative are negligible.

Conclusion

The IPM treatments under Alternative I would have minor beneficial effects to museum resources as preventative measures and inspections are frequently conducted.

Alternative II: Preferred Alternative - Current Management plus PUPS approved pesticide Zinc Phosphide and Immunocontraceptive treatments for the management of rodents and lagomorphs.

Impact Analysis:

The impacts to museum collections are the same for both alternatives. Museum collections are frequently inspected and treated for pest species to prevent potential impacts.

Mechanical: The treatments would be the same as Alternative I.

Chemical: The treatments would be the same as Alternative I because zinc phosphide and immunocontraceptives would not be applied within buildings and therefore would have no impact and/or effect.

Biological: The treatments would be the same as Alternative I.

Cultural: The treatments would be the same as Alternative I.

Cumulative Impacts

The cumulative impacts are the same for both alternatives.

Conclusion

The IPM treatments under Alternative II would have minor beneficial effects to museum resources as preventative measures and inspections are frequently conducted, similar to Alternative I. Cumulative effects of the alternative are negligible.

SPECIAL STATUS SPECIES/ WILDLIFE

Affected Environment

A review of the Arizona State Wildlife Species of Concern, List of Migratory Birds listed under the Migratory Bird Act of 1918, and Federally Listed Threatened and Endangered Species identified the following animals as potential pests which may be impacted under the alternatives described in this document. In regards to the lethal treatments of birds which are listed on the Migratory Bird Treaty Act of 1918 the act states the following: " Authority for the Secretary of the Interior to determine, periodically, when, consistent with the Conventions, "hunting, taking, capture, killing, possession, sale, purchase, shipment, transportation, carriage, or export of any . . . bird, or any part, nest or egg" could be undertaken and to adopt regulations for this purpose. These determinations are to be made based on "due regard to the zones of temperature and to the distribution, abundance, economic value, breeding habits, and times of migratory flight." (16 U.S.C. 704)" Not all of these animals have been documented to inhabit CAGR lands. The species inventory conducted in 2006 identified thirteen species of mammals, fourteen amphibian and reptile species, eighty-two species of birds, and sixty plant species. There is no record of the number of invertebrate species, but numerous black widows and Arizona recluses have been observed and treated under the Current Management alternative within the Visitor Center. No threatened or endangered species have been identified within CAGR. Although the Tucson Shovel Nosed Snake (*Chionactis occipitalis Klauberi*) is listed below as a species of concern, it has not been observed within CAGR; the habitat range of this species is relatively close to CAGR, however. For additional information regarding special status species and all species that have been specifically identified within CAGR, please see local, county, state and federal websites.

Table 5: Special Status Species at CAGR with potential pest behaviors.

Species Name	Status	Proposed Action
HOUSE FINCH (<i>Carpodacus mexicanus</i>)	Migratory Bird Act Listing	Exclusion from buildings and key archeological features
INCA DOVE (<i>Scardafella inca</i>)	Migratory Bird Act Listing	Exclusion from buildings and key archeological features; lethal treatments (i.e. shooting) in accordance with federal laws; and/or relocation if feasible.
MOURNING DOVE (<i>Zenaida macroura</i>)	Migratory Bird Act Listing	Exclusion from buildings and key archeological features; lethal treatments (i.e. shooting) in accordance with federal laws; and/or relocation if feasible.
WHITE-WINGED DOVE (<i>Zenaida asiatica</i>)	Migratory Bird Act Listing	Exclusion from buildings and key archeological features; lethal treatments (i.e. shooting) in accordance with federal laws; and/or relocation if feasible.

WESTERN BURROWING OWL (<i>Athene cunicularia</i>)	Migratory Bird Act Listing Arizona Wildlife Of Special Concern	Passive relocation when possible; otherwise active relocation methods will be used.
GREAT HORNED OWL (<i>Bubo virginianus</i>)	Migratory Bird Act Listing	Passive relocation when possible; otherwise active relocation methods will be used.
TUCSON SHOVEL NOSED SNAKE (<i>Chionactis occipitalis Klauberi</i>)	Arizona Wildlife of Special Concern, Endangered Species Act Protection pending	Passive relocation when possible; otherwise active relocation methods will be used.

Methodology and Intensity Thresholds

This section is intended to augment the impact analysis for natural systems and processes, by analyzing specific impacts of the proposed management alternatives upon federally listed threatened, endangered, and other sensitive species. Unless specifically noted in this analysis, both short-term and long-term impacts are the same.

Table 6: Impact Intensities and Definitions – Special Status Species

Impact Intensity	Intensity Definition
Negligible	An action that would not affect any individuals of a special status species or their habitat within CAGR.
Minor	An action that would affect a few individuals of special status species or have very localized impacts upon their habitat within CAGR. The change would require considerable scientific effort to measure and have barely perceptible consequences to the species or habitat function.
Moderate	An action that would cause measurable effects on: (1) a relatively moderate number of individuals within a special status species population, (2) the existing dynamics between multiple species (e.g., predator-prey, herbivore-forage, vegetation structure-wildlife breeding habitat), or (3) a relatively large habitat area or important habitat within CAGR. A special status species population or habitat might deviate from normal levels under existing conditions, but would remain indefinitely viable within the monument.
Major	An action that would have drastic and permanent consequences for a special status species population, dynamics between multiple species, or almost all available critical or unique habitat area within CAGR. A special status species population or its habitat would be permanently altered from normal levels under existing conditions, and the species would be at risk of extirpation from the monument.

Duration of special status species impacts is considered short-term if special status species recovers in less than three years and long-term if the special status species takes longer than three years to recover.

Alternative I: Current Management – Mechanical, cultural, and biological treatments with minimal use of PUPS approved pesticide treatments for invertebrate pest species would be used to manage pests at CAGR.

Impact Analysis

Pest species are currently having a moderate impact on the overall health of wildlife habitats within CAGR. Implementation of Alternative I: Current Management addresses this threat while also ensuring that non-target and special status species are not unduly impacted. Permits would be obtained from state and federal agencies prior to relocation of the special status species.

Mechanical: Mechanical treatments would be burrow filling, exclusionary devices, snap/sticky traps, and lethal control of target individuals from those species that have been identified as potential pests in this document and attached reports. House finches, Inca doves, mourning doves and white winged doves have been identified as potential pest species that may nest within structural cracks and archeological features of the Great House. Lethal control of these species may be implemented on an as needed basis by USDA-APHIS and wildlife consulting agencies. However, the frequency of this action is limited and does not negatively impact population trends or viability. All required permits must be obtained from state and federal agencies in order to use lethal control on special status species. A program to use lethal control on animals exhibiting pest behaviors that are non-special status species has been in place under the current management alternative since 2007. Live traps may be used and only target species would subsequently be eliminated. Non-target species would be released. Snap/sticky traps would be minor impact because of the potential to impact non-target species but would be conducted in limited and localized areas. Sticky traps are used in buildings for invertebrate monitoring only. Filling burrows would be a minor impact because of the potential to impact non-target species. Mitigation measures for this treatment would be to fill burrows of known target species and the potential to impact the species is lower because of the extensive connection among burrows. Caging plants would have a minor impact because removal of food sources and possibly habitat from non-target species could inhibit the population. Exclusionary devices would be minor impact because of the potential to trap wildlife within the walls. Mitigation measures for these treatments would be one-way openings (allowing the wildlife to leave but not re-enter) and disturbing the wildlife to cause them to move out of the area. The potential to harm or disturb the wildlife or special status species would be localized to this specific area.

Chemical: The chemical treatments are limited to the use of pesticides on invertebrates and would occur within buildings. The impacts would be negligible to minor, adverse, and localized because of the potential to impact non-targeted species. Soapy water would be negligible because of the use of environmentally friendly soap would not be harmful to wildlife. Taste and smell deterrents would be negligible to minor because of the potential to affect non-target species but would not be lethal. Termite treatments would be a negligible to minor impact because of the potential to harm non-target species. Mitigation measures for these treatments would be limited use to buildings or close proximity to the exterior of the buildings.

Biological: Biological treatments include raptor flights which discourage other birds from roosting in un-desired areas, raptor encouragement, relocation efforts, and artificial habitats. Raptor flights would be negligible to minor impact because of the minimal disturbance to non-target species. Raptor encouragement is a negligible to minor impact because of the potential to impact burrowing owls and Tucson shovel nosed snake, which are species of concern. The successful relocation of a great horned owl nestling from a fragile archeological feature, to a nesting box affixed to the Ruins Shelter is also included in Alternative I; Current Management. Artificial habitats for the burrowing owls and other predator species in short term impact would be minor with adverse effects because of the disturbance of the wildlife and special status species. Long term impact would be negligible to minor with beneficial effects because of the habitat improvement. The artificial habitats would be built outside the boundaries of known archeological sites.

Cultural: Cultural treatments would be removing food sources; drip systems; visual and sound deterrents. Removing food sources would be negligible to minor impacts because of the potential to decrease food supply for non-targeted species but limited to only public areas. Drip system would be negligible to minor impacts because of reducing water supply and impacting non-targeted species but limited to only public areas. Visual and sound deterrents would be a minor impact to wildlife species because of disturbing the non-targeted species. The deterrents would be a short term negative impact because use of these deterrents would be limited. It would reduce pest species but could also impact non-targeted wildlife and special status species. The long-term impacts would be negligible with beneficial effects, and localized by reducing the pest species.

Cumulative Impacts

Agricultural activities and urban development have resulted in increased wildlife populations within the monument due to loss of habitat outside of the monument. These activities have also resulted in an increase of pest species moving into the monument to find suitable, native habitats. Construction of the theater is in an area of high visitor use, and low wildlife use. Construction of a backcountry trail could result in an increase in human and wildlife interactions that could have a minor impact, adverse effect. Cumulatively, the impacts of this alternative would have a negligible impact on wildlife and special status species.

Conclusion

Pest individuals that impact specific monument resources would be treated under Alternative I. Short-term impacts from pest treatments could have a minor impact with adverse effects under the worst-case scenario in the unlikely event that a non-target species was unintentionally eliminated. The long-term impacts from IPM are minor with beneficial effects because it would result in increased resources available to non-target and special status species. Cumulative effects of the alternative are negligible.

Alternative II: Proposed Action - Current Management plus PUPS approved pesticide Zinc Phosphide and Immunocontraceptive treatments for the management of rodents and lagomorphs.

Impact Analysis

Pest species are currently having a moderate impact on the overall health of wildlife habitats within CAGR. Implementation of Alternative II efficiently addresses this threat while also ensuring that non-target and special status species are not unduly impacted.

Mechanical: The treatments would be the same as Alternative I.

Chemical: The chemical treatments would include zinc phosphide and immunocontraceptive treatments for rodent species. There are two major forms of transmission for chemicals which are primary and secondary. Primary transmission is the direct ingestion of the chemical and secondary is the indirect mode of transmission which includes predators consuming prey that had ingested the chemical. Zinc phosphide is highly toxic to non-targeted species especially bird and fish species but is insoluble in water (Cornell University, 1993). "Secondary toxicity to mammalian predators from zinc phosphide is rather low (2) primarily because the compound does not significantly accumulate in the muscles of target species. Some of the toxic effects to predators have been due to the ingestion of zinc phosphide that was in the digestive tract of the target organism (the prey). However, most predators will not eat the digestive tract. Studies on secondary organisms have focused on coyotes, fox, mink, weasels and birds of prey. Under field conditions most of the toxic effects to non-target wildlife are due to misuse or misapplication of this rodenticide (2) (Cornell University, 1993)." For additional information in regards to zinc phosphide please see the Cornell University reference below and refer to the website listed. The impact from these treatments would be minor impact to non-target but moderate impact to target species because of the potential for the chemicals to go through a secondary transmission as

well as a primary for non-targeted species. Mitigation measures for these treatments would be application by trained professionals with a pesticide license and certified to use restricted use pesticides from the state agency in a well-controlled environment, additional permits from National Park Service and prior testing has been conducted on these chemicals (Zinc phosphide was tested by USDA-APHIS within CAGR but immunocontraceptives have not been tested within CAGR). Zinc phosphide would only have a potential to be consumed by non-targeted species if not consumed by targeted species, which is mitigated by placing the baited chemicals directly within the known target burrows. The chemical would not have a chance to go through secondary transmission because it turns to phosphide gas in the stomachs of rodents (Cornell University, 1993). There are no known secondary effects to the wildlife species after consumption of the immunocontraceptives (for more information, refer to Cornell University 1993). Immunocontraceptives have been heavily studied for over 20 years and it is not a lethal method of control but it controls reproduction. These chemicals would be applied by trained and certified professionals and would require additional permits from the National Park Service to help reduce any negative effects. Any and all chemicals for this control would be moderate because of the potential to come into contact with non-targeted species although would be applied by professionals to reduce the negative effects.

Biological: The treatments would be the same as Alternative I.

Cultural: The treatments would be the same as Alternative I.

Cumulative Impacts

Cumulative effects are similar to Alternative I.

Conclusion

Under Alternative I, population control measures may be employed but would be less efficient than those proposed in Alternative II. The short-term impacts to wildlife and special status species from the actions proposed in Alternative II have the potential to have moderate impacts with adverse effects – in the unlikely event of the worst-case scenario where non-target rodents ingested zinc phosphide. There are no known cases of secondary poisoning from zinc phosphide. The long-term impacts from IPM are moderate with beneficial effects, and localized because reduction in pest populations would allow for increased use of resources and habitat for non-target and special status species. Additionally, zinc phosphide and immunocontraceptives would not be used to treat any special status species and these treatments are limited to rodents and lagomorphs. Cumulative effects of the alternative are negligible.

HUMAN HEALTH AND SAFETY

Affected Environment

The affected areas of the monument are any areas with regular human interaction with pest safety issues. The picnic area, visitor center, and Compound A with the Great House are places where members of the visiting public regularly come into contact with pest animals. Hazards within these areas include the risk of people tripping and falling related to collapsing burrows where rodents have tunneled just beneath the ground surface. Other hazards are: bites, scratches, and the potential spread of animal borne diseases. Potential animal borne diseases would be rabies, and Hantavirus pulmonary syndrome. Rabies is a potential threat from animal bites, scratches and direct saliva to blood contact from infected animals. Hantavirus is an air borne disease from the disturbance of feces and urine deposits. Histoplasmosis is caused by bird or bat droppings that grow a fungus in the soil. For more information regarding these diseases or other animal borne disease please visit the Center for Disease Control website at <http://www.cdc.gov/>. These potential health and safety threats may pose a higher level of risk to park staff due to increased exposure. Regularly scheduled tasks such as sweeping up the debris left by birds in the Great House, removing weeds, emptying outdoor trash cans, stabilizing archeological sites, maintaining outdoor exhibits, resource monitoring, surveys and studies, cleaning, leading tours, building maintenance, and landscape maintenance all potentially include

human to animal interaction. Some potential health and safety risks for monument staff can be mitigated through the use and understanding of the job hazard analysis documents; and the proper use of personal protective equipment (PPE) which includes the use of a respirator for specific tasks.

Methodology and Intensity Thresholds

The following definitions are used to define intensity levels for all human to animal interaction including visitor use and the activities conducted by monument staff. Each impact may be classified as either beneficial or adverse. A beneficial impact provides increased protection against potential health and safety risks. An adverse impact poses additional threats to human health and safety within the monument. Unless specifically noted in this analysis, both short-term and long-term impacts are the same.

Table 7: Impact Intensities and Definitions – Human Health and Safety

Impact Intensity	Intensity Definition
Negligible	Impacts to human health and safety would be below the level of detection.
Minor	Impacts to human health and safety would be detectable, but the changes would be slight and likely short-term.
Moderate	Changes in human health and safety would be readily apparent and likely long-term.
Major	Changes in human health and safety would be readily apparent and have important long-term effects.

Duration of human health and safety impacts is considered short-term if human health and safety recovers in less than three years and long-term if the human health and safety takes longer than three years to recover.

Alternative I: Current Management – Mechanical, cultural, and biological treatments with minimal use of PUPS approved pesticide treatments for invertebrate pest species would be used to manage pests at CAGR.

Impact Analysis

The risks to human health and safety are greater under Alternative I than Alternative II. Rodent burrows in the vicinity of high visitor use areas pose a large threat to visitor safety. This alternative does not include the most effective treatment methods such as zinc phosphide to effectively eliminate rodents, and immunocontraceptives to help reduce rodent populations.

Mechanical: Proposed mechanical treatments all cause minor, beneficial, and localized impacts. Mechanical treatments include snap traps, filling burrow, caging plants, and exclusionary devices. Snap traps are a negligible impact with beneficial effects because removing rodents such as mice and rats reduces health risks. Mice and rats can carry the Hanta virus along with other diseases therefore removing the rodents reduces the interaction between human and animals. Filling burrows is a negligible impact with beneficial effects because it reduces hazards of tripping and discourages rodents from burrowing in public areas. Caging plants reduces food sources available to pest species which reduces health and safety risks and therefore is a negligible impact with beneficial effects. Exclusionary devices are a negligible impact with beneficial effects which reduces the amount of pest species living in the Great House and therefore decreases the human and animal interaction.

Chemical: Chemical treatments for invertebrate pests include limited use of chemicals that are relatively harmless to humans such as: soapy water and taste and smell deterrents. Invertebrate pesticides can pose a risk to human health and safety by causing irritation to sensitive individuals. Whenever possible, chemicals are applied when the monument is closed. These pesticides also have a positive effect on human health and safety by eliminating hazardous pest species such as centipedes and black widow spiders. Soapy water is a negligible impact with beneficial effects by reducing pest species such as bees without harm to the human health and safety. Taste and smell deterrents are a

negligible impact with beneficial effects by reducing pest species in public areas. Taste and smell deterrents have a negligible impact with adverse effects because of potential for humans to come in contact with the products. These products could cause a mild eye irritant. Overall, chemical treatments could have a minor, adverse effect on human health and safety for sensitive individuals in the short term. In the long-term the effects would be moderate and beneficial.

Biological: The biological treatments include raptor flights and predator encouragement has a negligible effect on human health and safety. Artificial habitats reduce the pests because they encourage predation in specific areas of the monument without posing an impact to human health and safety.

Cultural: Cultural treatments include removal of food sources, drip system, education, sanitation, and visual and sound deterrents. Removal of food sources is a negligible impact with beneficial effects which reduce the pest species in public areas. Drip system is a negligible impact with beneficial effects which reduce the pest species in public areas. Education is a minor impact with beneficial effects because educating the public not to feed the animals would reduce the chances of getting bitten. Sanitation is a negligible impact with beneficial effects by reducing pest species in public areas through keeping areas clean of any attractants. Visual and sound deterrents are a negligible impact with beneficial effects to human health and safety by reducing the pest species within public areas.

Cumulative Impacts

Agricultural activities and urban development result in increased pest species within the monument, resulting in a slight increase in risks to human health and safety. The construction of the theater and trails are not expected to have an impact on human health and safety. The cumulative effects of the implementation of Alternative I would have a negligible effect on human health and safety.

Conclusion

Implementing treatments as described in Alternative I reduces the threats to human health and safety that are posed by human to animal interaction. While there is the potential for pesticides to cause irritation to sensitive individuals, these risks are less than leaving pest species untreated. Overall, the impacts from Alternative I have a minor beneficial impact to human health and safety in the short and long term. There would not be any an increase in cumulative effects from this alternative.

Alternative II: Proposed Action - Current Management plus PUPS approved pesticide Zinc Phosphide and Immunocontraceptive treatments for the management of rodents and lagomorphs.

Impact Analysis

This alternative would provide the most protection for the health and safety of visitors and staff. This alternative proposes to use a full range of integrated pest management techniques that will provide the most effective pest treatments in a timely manner. This alternative also is more proactive in the implementation of preventative measures, such as the use of immunocontraceptives.

Mechanical: The treatments would be the same as Alternative I.

Chemical: The chemical treatments include zinc phosphide and immunocontraceptives to control rodents and lagomorphs. These pesticides are a minor to moderate impact with beneficial effects because of removing pest species from high visitor use areas which reduce the potential for human and animal interactions. It is unlikely that visitors and staff would come in contact with the zinc phosphide. The pesticide would be applied at night on active burrows. (When an emergency treatment was conducted in 2004 by USDA-APHIS, burrows were monitored the next morning all zinc phosphide and bait had been consumed.) The treated area would be inspected prior to opening to visitors and any treated bait remaining would be removed. Even if visitors or staff were to come in contact with zinc phosphide, this chemical poses minimal risks to human health.

Zinc phosphide and immunocontraceptives would be carefully applied by trained and certified professionals in a well-controlled environment. Because limited amounts of carefully controlled pesticides would be applied, it is expected that there would be a minor to moderate impact with beneficial effects because of the decrease of potentially hazardous rodent burrows in public areas.

Biological: The treatments would be the same as Alternative I.

Cultural: The treatments would be the same as Alternative I.

Cumulative Impacts

The cumulative impacts are similar to Alternative I.

Conclusion

Use of carefully applied pesticides in low doses would reduce the population of pest species within high public use areas and alleviate the threats to human health and safety that they pose. With fewer interactions between humans and wildlife the human safety would increase at CAGR due to a decreased risk of disease and animal bites. There would be a decrease in tripping and falling hazards due to reduced pest species burrowing in public areas. The impacts from IPM treatments for Alternative II are minor to moderate with beneficial effects to human health and safety in the short and long term. There would not be any increase in cumulative effects from this alternative.

Unacceptable Impacts and Impairment

As described in the introduction to this chapter, unacceptable impacts are those that fall short of impairment, but are still not acceptable within a particular park's environment.

Both alternatives are consistent with the monument's purposes and values. The monument was established for resource protection and visitor enjoyment and both alternatives protect resources to the maximum extent possible and provide opportunities for visitor enjoyment. Neither alternative impedes the attainment of the parks' desired future conditions as this project is consistent with previous planning efforts. The analysis of effects on employee and visitor health and safety indicated that there are no major adverse effects under either alternative; effects were analyzed as minor to moderate. Under either alternative, visitors continue to have opportunities to enjoy, learn about, or be inspired by park resources and values. Impacts to park operations and cultural resources are minor to moderate under both alternatives. There are impacts to wildlife, but impacts are minor to moderate and would not result in unacceptable impacts or impairment. Both alternatives provide for integrated pest management treatments that do not unreasonably interfere with park programs, an appropriate use, or the natural atmosphere.

As described in the Purpose and Need section/chapter, the NPS's threshold for considering whether there could be impairment is based on major (or significant) effects. This EA identifies less than major effects for all resource topics. Guided by this analysis and the Superintendent's professional judgment, there would be no impairment of park resources and values from implementation of either alternative.

CONSULTATION AND COORDINATION

External Scoping

External (public) scoping was conducted to inform various agencies and the public about the proposal to implement IPM at CAGR, and to generate input on the preparation of this Environmental Assessment.

Fifty-six papers nationwide have printed the bird and rodent issues and those articles resulted in comments, emails and phone calls from concerned individuals. On March 10, 2005, Casa Grande Ruins held an open house for individuals interested in the pest control issue. During the after-hours open house (held from 5pm to 7pm), five people left written comments which supported the goal of minimizing and controlling the pest populations. There were several comments such as trap-relocation; light flares and bury them; predator encouragement (cats); digging trenches around the ruins; implementing a cement underground foundation; encapsulate the whole Ruins with Plexiglas, and many more.

External scoping was initiated with the distribution of a scoping letter to inform the public of the proposal to implement integrated pest management, and to generate input on the preparation of this Environmental Assessment. The scoping letter from CAGR was dated May 13, 2009. This letter was sent to various federal and state agencies, affiliated Native American tribes, local governments, and local news agencies. No comments were received.

Federal Agencies

U.S. Department of Agriculture- Animal Plant Health Inspection Service – Wildlife Services

US Fish and Wildlife Service.-The US Fish and Wildlife Service received a copy of the project initiation letter and no comments were received. Park staff conducted an assessment of impacts to threatened, endangered and candidate species as part of this analysis. It was determined this project would have No Effect on listed or candidate species. Therefore, no further consultation was conducted.

State Agencies

State Historic Preservation Office

City of Coolidge

Town of Florence

Coolidge Examiner

Tribal Nations

Scoping was conducted with the following Affiliated Native American Groups:

Salt River Pima-Maricopa Indian Community

Tohono O'odham Nation

Ak-Chin Indian Community

Hopi Tribe

Pueblo of Zuni

Gila River Indian Community

Suggestions and comments raised during consultations with representatives from these tribes have been incorporated into the current management and preferred alternative that are put forth in this document. This project has been ongoing since 2005 when tribes were initially contacted. Some tribes asked to be kept informed on the progress of the analysis. Additional updates were presented by CAGR staff at Four Tribes of Southern Arizona Cultural Resources Working Group meetings every year from 2005 to 2010. A public scoping letter was sent to each of the six tribes on 05/16/2009, and CAGR staff solicited additional comments regarding this project at the Four Tribes of Southern Arizona Cultural Resources Working Group meeting on 5/19/2009.

Internal Scoping

Internal scoping was conducted by an interdisciplinary team of professionals from Casa Grande Ruins National Monument on December 2, 2004. Additional consultation was conducted with staff from NPS SOAR, Integrated Pest Management Staff, and professionals from the Wild Edge Conservation Science. Interdisciplinary team members meetings were to discuss the purpose and need for the

project; various alternatives; potential environmental impacts; past, present, and reasonably foreseeable projects that may have cumulative effects; and possible mitigation measures. The team also gathered background information and discussed public outreach for the project. Over the course of the project, team members have conducted individual site visits to view and evaluate the proposed construction site, and discussed the impact analyses associated with this assessment. The results of multiple meetings are documented in this Environmental Assessment.

Other internal meetings involving the environmental assessment of the integrated pest management program include the following:

- December 2, 2004 – IDT initial scoping meeting with CAGR; attending were Duane Hubbard, Don Swann, Dave Winchester, Dawn Daw, Shirley Hoh, Debbie Angell, Carol West, Peter Holm, Brad Traver, Brooke Gebow, Brian Powell, Danielle Foster, Sarah Craighead, Paige Baker, Michele Girard, Rick Shireman, and Randy Skeirik
- October 5, 2005 -- CAGR meeting to work on the EA; attending were Carol West, Rebecca Carr, Kevin Harper, Paige Baker, and Michele Girard
- October 24, 2005 – CAGR meeting to schedule and work on EA; attending were Carol West and Michele Girard
- February 23, 2006 – CAGR meeting to work on the EA; attending were Carol West, Rebecca Carr, Cheryl Eckhart, Laurie Domler, and Michele Girard
- March 14, 2006 – All forty participants in the Vanishing Treasures Program Workshop for Sustainable Pest Management
- January 14, 2009 – CAGR meeting to work on the EA; attending were Rebecca Carr, Ashley McCabe, and Michele Girard
- March 9, 2009 – CAGR/TONTO/TUZI meeting to work on the EA; attending were Rebecca Carr, Ashley McCabe, Duane Hubbard, Jenny Shrum, Dennis Casper, and Michele Girard
- February 24, 2010 – Conference call to work on the EA; attending were Karl Cordova, Rebecca Carr, Cheryl Eckhardt, Chanteil Walter, and Ashley McCabe
- April 22, 2010 – CAGR meeting to work on the EA; attending Karl Cordova, Rebecca Carr, and Ashley McCabe
- July 12, 2010 – CAGR meeting to work on the EA; attending Karl Cordova, Rebecca Carr, and Ashley McCabe

Environmental Assessment and Review and List of Recipients

The Environmental Assessment would be released for public review January 14, 2011. To inform the public of the availability of the Environmental Assessment, NPS would publish and distribute a letter or press release to various agencies, tribes, and members of the public on the National Monument's mailing list, as well as place an ad in the local newspaper. Copies of the Environmental Assessment would be provided to interested individuals upon request. Copies of the document would also be available for review at the Monuments' visitor centers and on the internet at www.nps.gov/cagr/.

The Environmental Assessment is subject to a 30-day public comment period ending February 14, 2011. During this time the public is encouraged to post comments online at <http://parkplanning.nps.gov/> or mail comments to Superintendent; Casa Grande Ruins National Monument; 1100 West Ruins Drive, Coolidge, Arizona 85228. Following the close of the comment period, all public comments would be reviewed and analyzed prior to the release of a decision document. NPS would issue responses to substantive comments received during the public comment period, and would make appropriate changes to the Environmental Assessment as needed.

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