



National Park Service
U.S. Department of the Interior
Tonto National Monument
Roosevelt, Arizona

Integrated Pest Management Environmental Assessment/Assessment of Effect

December 2010



Integrated Pest Management Plan

Environmental Assessment/Assessment of Effect

Summary

Throughout the history of the National Park Service (NPS) maintaining the balance between resource protection, visitor safety, and pest management has been an ongoing challenge. Pests create public health hazards around the cliff dwellings, various buildings, the picnic area, and park trails at Tonto National Monument (TNM). Animals nesting within prehistoric walls and burrowing through prehistoric floors have damaged irreplaceable archeological features. Africanized honey bees building hives in crevices adjacent to the cliff dwellings are posing a serious threat to park staff and visitors. The Cliff Dwellings are the primary attractions at the monument. Frequent closures of the dwellings due to bee activity have an adverse impact on visitors who have driven many miles to visit the monument and experience the cultural resources. A structured, interdisciplinary approach to pest management is necessary for the long-term preservation and protection of natural resources, cultural resources and the people that enjoy them.

This Integrated Pest Management Plan and Environmental Assessment/Assessment of Effect outlines alternative vertebrate and invertebrate pest management strategies that are based on the principles of Integrated Pest Management (IPM) using control techniques including some or all of the following: mechanical, cultural, chemical, and biological treatments. This document evaluates two alternatives. The no- action alternative describes the current strategy of using limited mechanical treatments. The second alternative would use a full range of integrated pest management techniques.

This Environmental Assessment/Assessment of Effect 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 Tonto National Monument, and 3) identifies mitigation measures to lessen the degree or extent of these impacts. Resource topics that are included in this document because the resultant impacts may be greater-than-minor include: Human Health and Safety, Visitor Use and Experience, Park Operations, Archeological Resources, and Wildlife. All other resource topics have been dismissed because the project would result in negligible or minor effects to those resources. No major effects are anticipated as a result of this project. No public comments were received during the initial scoping period.

Public Comment

If you wish to comment on the document, you may post comments online at <http://parkplanning.nps.gov/tont> or mail comments to Tonto National Monument; 26260 N. AZ. Highway 188, Roosevelt, Arizona 85545. This document 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 will be able to do so. We will make all submissions from organizations, businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses available for public inspection in their entirety.

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PURPOSE AND NEED

Introduction

Tonto National Monument (TNM) is located on the southwest side of Roosevelt Lake along Hwy 188 approximately 30 miles northwest of Globe, Arizona and 50 miles southeast of Payson, Arizona (Figure 1). TNM is within the Tonto Basin which includes the Salt River and Tonto Creek, portions of which are now Roosevelt Lake. The area has a long history of human occupation that began nearly 10,000 years before present with mobile groups of Archaic hunters and later groups that began seasonal farming and wild food gathering. Permanent occupation began around A.D. 600 – 700 in the Tonto Basin and the Tonto Cliff Dwellings were occupied from A.D. 1300 to 1450. The extraordinary value of the cliff dwellings was first formally recognized in 1907 when 640 acres was designated as Tonto National Monument under the care of the US Forest Service. In 1933 the monument was placed under the jurisdiction of the National Park Service (NPS) and expanded to its present size of 1120 acres.

NPS has the jurisdiction to preserve and protect the cultural and natural resources of the monument, including the upper and lower cliff dwellings. Native and non-native insects, rodents and birds that inhabit the monument are causing damage to the dwellings, park structures (including historic buildings and staff residences), and posing a risk to human health and safety. Tonto National Monument proposes to use a variety of integrated pest management (IPM) treatments to control these species, reduce risks to health and safety, reduce damage to the resources, and enhance the visitor experience.

“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 Environmental Assessment/Assessment of Effect is to examine the environmental impacts associated with integrated pest management. This Environmental Assessment/Assessment of Effect was 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 Director’s Order (DO)-12 (*Conservation Planning, Environmental Impact Analysis, and Decision-Making*).

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

However, the laws do give the National Park Service the management discretion to allow

impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the National Park Service the management discretion to allow certain impacts within park, that discretion is limited by the statutory requirement that the National Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of these resources or values. An impact to any park resource or value may, but does not necessarily, constitute an impairment, but an impact would be more likely to constitute an impairment when there is a major or severe adverse effect upon a resource or value whose conservation is:

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

An impact would be less likely to constitute an impairment if it is an unavoidable result of an action necessary to pursue or restore the integrity of park resources or values and it cannot be further mitigated. An impairment analysis for the preferred alternative can be found in Appendix A.

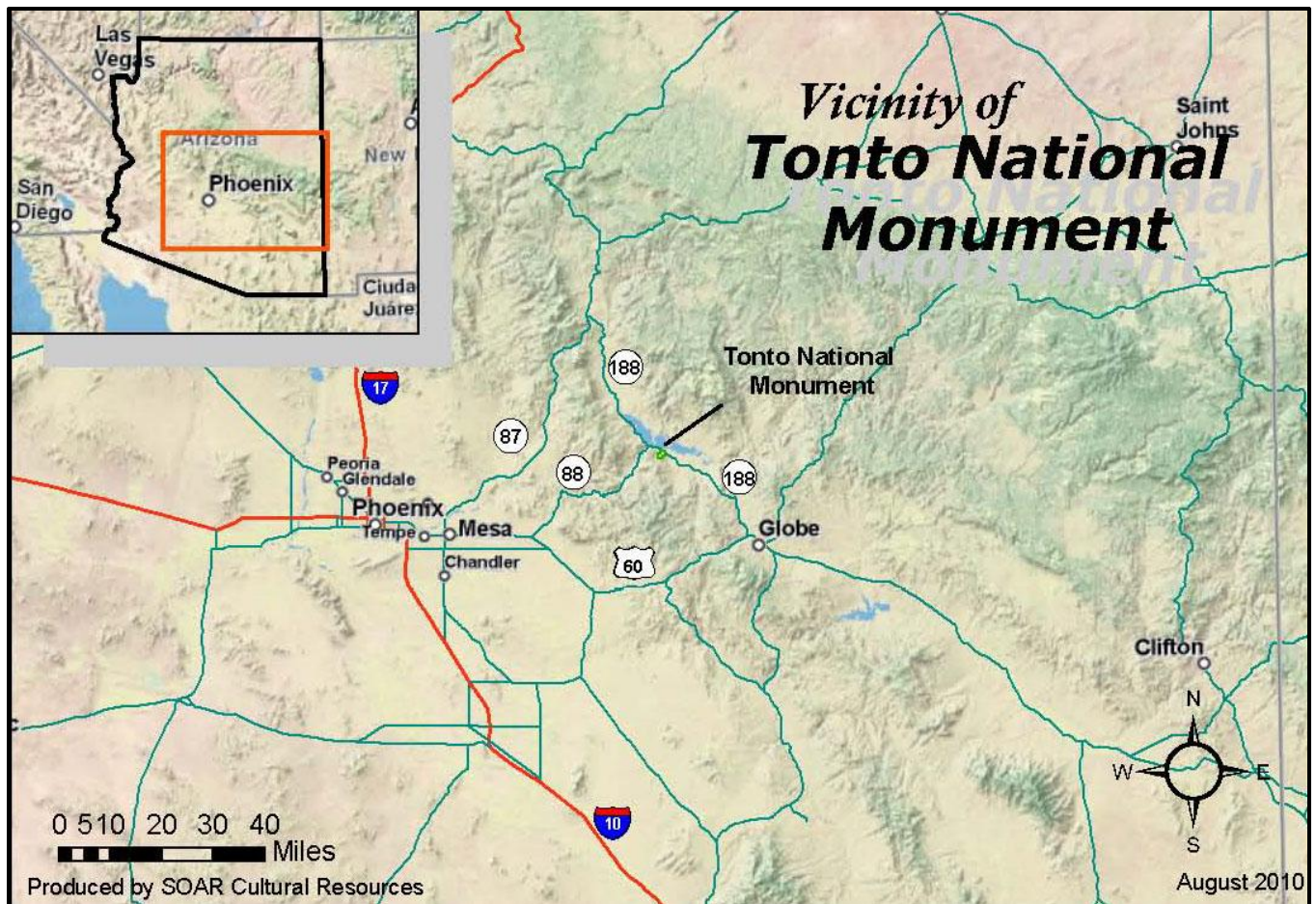


Figure 1: Tonto National Monument and Central Arizona

Background

Management of pest species at TNM is a consistent, cyclic issue that has impacted the monument for decades. Currently, honey bees both European and Africanized are the most serious pest problem at the monument. Documentation on problems with European honey bees dates back to the 1930's. Currently, large active hives of Africanized honey bees are posing a threat to human health and safety of visitors and staff in the vicinity of the parks primary resources – the cliff dwellings. Other priority pest species include small mammals in the cliff dwellings and rodents and invertebrates in park facilities.

Honey Bees: There are two strains of non-native bee species present in the monument. There are European honey bees (*Apis mellifera*) and the Africanized honey bee (*Apis mellifera scutella*). Africanized honey bees are a hybrid between domesticated European honey bees and an African strain that was released in Brazil in 1957. The two strains are difficult to distinguish without genetic testing. The Africanized strain is less selective in their nest locations and will utilize tree and cacti hollows, rock crevices, buildings, discarded tires, and exposed areas such as tree limbs.

Africanized bees are more aggressive when attacking and attack more swiftly and intensely than European honey bees. Africanized bees are more likely to mount a prolonged attack,

sometimes following a victim up to one mile. This behavior has earned them the title “killer bees”. Stinging or injured bees release a pheromone that stimulates other bees to attack. Attacking Africanized honey bees can deliver 400-500 stings in a short time. The accumulated toxin from 500 stings can kill the average adult.

Bee problems at the monument date back to the 1930’s when staff first noted that bees were active in the cliff dwellings and posed a potential danger to visitors. The park’s administrative record including superintendent’s annual reports and memos document the long history of bee activity at the park. In the 1990’s, the bees were tested and results showed that some of the bees were of the aggressive and dangerous Africanized strain.

For centuries, bee keepers worldwide have cultivated the European (or Western) honey bee, *Apis mellifera*, for their desirable traits including winter hardiness, disease resistance, tendency not to swarm, and overall gentleness. Along with producing honey, honey bees are important for pollination of plants. Many foods and fibers produced for humans rely on honey bee pollination for its production. However, the European honey bee tends to be less productive than other honey bee species in tropical climates (such as, the more aggressive African honey bee, *Apis mellifera scutellata*). In the 1950s, researchers in Brazil crossbred the European and African honey bees to improve honey production. As the “Africanized” bees increased in population, they began to move and increase their range, eventually crossing the U.S.’s border with Mexico in 1990. The Africanized bees we see today are more defensive (aggressively attacking perceived threats to their colony), more tolerant of extreme weather conditions, and more apt to swarm (divide the colony).

Typically, the role of the Africanized honey bee occupies the same niche the European strain and provides a valuable service by pollinating the hundreds of plants found at Tonto National Monument. Bees are generalists, meaning that they harvest nectar from a wide variety of plants. Africanized honey bees live in hives where they store their honey and rear their young. These hives are established in a variety of crevices, including those found in the ground, trees, and rock faces.

Many bee removal techniques were attempted after the 1930’s including several that posed tremendous risk to the safety of personnel implementing the treatments. Unfortunately, thorough documentation of treatment methods is lacking. Hives within reach are easily removed, but there are several (currently more than 10) hives that are established in the cracks and crevices above the dwellings and are very difficult to access. Methods to treat out-of-reach hives in the 1970’s involved people on ladders extended to 20 feet with extension poles to place chemical deterrents into the hives. In one of the most ambitious eradication efforts, staff rappelled down the face of the cliff over the Lower Cliff Dwelling to fill cracks and crevices with cement. No written documentation is available on when this occurred. Unfortunately, the natural crevices of the rock precluded complete exclusion, and along with erosion and tunneling by bees, many of these treated areas have been reoccupied by hives.

Early in the 2000’s a drought followed by an infestation of mites subdued the bee populations for several years. The staff recalls a period when the bees were not an issue (Susan Hughes and Eddie Colyott, personal communication). However, in 2008 – 2010 populations reached levels high enough that they frequently forced the closure of the cliff dwellings to visitors and staff. For approximately 20% of 2008 and 2009, visitors were allowed to go up the trail to view the Lower Cliff Dwelling but were not allowed access into the dwelling. Access to both the trail and the dwelling was denied for 11 days in 2008 and 7 days in 2009 due to bee danger. More recent eradication efforts have involved licensed pesticide applicators (trained and certified in

rappelling) to rappel down the cliff face to apply contact pesticides as an emergency treatment measure.

In response to the risks to human health and safety, park staff developed a modified Severity Probability Exposure (SPE) model to help assess the risks to human health and safety at the cliff dwellings at least once a day (Appendix B). The model, along with staff experience, helps determine whether the Lower Cliff Dwelling should be open or closed to visitation. The staff also developed an Africanized Honey Bee Safety Plan (Appendix C) outlining roles and responsibilities as well as emergency procedures in the event of a bee sting/attack.

Rodents. Mice have been documented in park facilities on numerous occasions and pose a threat to human health and safety as carriers of Hanta Virus. They also cause damage to facilities from chewing and burrowing. Mice are frequently captured in snap traps in all park facilities. The house mouse (*Mus musculus*) is non-native and the most common pest species present in the monument.

Rock squirrels (*Spermophilus variegates*) have been an issue in the cliff dwellings as documented in the park's administrative history. Rock squirrels burrow into the walls of the dwellings, impacting the original prehistoric building materials and causing irreparable damage to the structures. Park Ranger Eddie Colyott recalls that during the 1980s, park maintenance staff used to shoot the squirrels in the Upper Cliff Dwelling (Eddie Colyott, personal communication). Most problem squirrels are easily live-trapped and euthanized. Occasionally, squirrels avoid the traps, sometimes causing even greater damage as they burrow around the trap trying to reach the bait. On two occasions in recent history (2006 and 2008 both at the Upper Cliff Dwelling) the services of USDA Animal and Plant Health and Safety (APHIS) personnel assisted in the use of pesticides to eliminate these rodents. Over the last five years documentation shows that, on average, four rodents are removed from the dwellings each year.

Other rodent species are present in the monument. While no documentation is available demonstrating issues with other species, it is possible that they could become a pest in the future, such as the white-throated wood rat (*Neotoma albigula*). This wood rat has been known to nest in other prehistoric dwellings.

Termites and other invertebrates. Termites continue to be a problem in facilities at the monument. Although documentation is lacking, observations indicate that termites have been present and treated in the past in several buildings. An inspection by International Pest Management Institute in 2008 indicated signs of active termite colonies in several buildings. These infestations were treated using Termidor®. Other invertebrates such as scorpions and centipedes have been eliminated from the buildings on an as-needed basis. No routine spraying of pesticides is conducted in the monument.

The most common museum pests are two species of moths and several different species of beetles that are grouped together under the generic name of carpet beetles. The pests pose a risk to fragile museum collections such as textiles and other preserved materials. Many of these species are difficult to treat and prevention is the best method to preserve these collections. The monument is contracted with professional conservators at the Western Archeological Conservation Center to annually inspect all museum collections. The monument has a housekeeping plan for maintenance activities that are intended to help prevent pest species.

Birds. Birds roosting or nesting in the 'wrong' locations such as in the cliff dwellings or in other facilities can become pests. There are a number of bird species that could potentially become

pests. The removal of the nesting materials and exclusion of roosting places has been successful thus far.

Bats. Bats have not been a pest issue at TNM. However, a number of other NPS sites in Arizona with prehistoric structures have reported problems with different bat species including the free tailed and Mexican fruit bats. The bats can cause damage to sensitive cultural resources from roosting activities and guano deposits.

Snakes. TNM supports a healthy snake population, including many rattlesnakes. Rattlesnakes in areas of high visitor use can cause problems. These problem snakes are captured and moved to backcountry areas of the monument.

Other mammals. There are many native species that can become 'pests' depending on the circumstances. For example, at some parks badger burrows have caused serious impacts to cultural resource sites, rabbits have heavily browsed native vegetation in areas of high visibility and in interpretive areas, foxes have tunneled into the walls of above ground ruins, and there are many other examples.

The International Pest Management Institute conducted inspections at TNM from 2008-2009, and produced an IPM Action Plan for the monument (2009). This document describes the results of inspection findings and recommendations for park facilities, a description of various IPM methods, autecological information and effective treatment methods for several pest species and other related IPM information. Please refer to this document for more detailed information.

Purpose and Need

The purpose of this EA is to evaluate the environmental effects of implementation of IPM procedures at the monument. While the IPM Action Plan (2009) outlines pests and treatment methods, it does not address the potential for unwanted environmental effects from some of the proposed treatments, nor does it lay out a decision matrix on how to determine when treatment is needed as will be defined this Management Plan and Environmental Assessment/Assessment of Effect.

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." 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 the potential impacts posed by non-native, invasive species and overpopulation of native species whose natural balances within this small monument have been disrupted.

The above Background section described the history of pest problems at the monument. While 'minor' infestations have been dealt with on an as-needed basis, the long-term problem of active Africanized honey bees in the vicinity of the cliff dwellings has been an ongoing problem. Their presence poses a serious threat to human health and safety due to the risk of stings and attacks from this aggressive strain of bees. The primary monument resources – the cliff dwellings – are frequently closed to visitors because of these risks. Continued issues with small mammals burrowing into the original prehistoric fabric of the cliff dwellings is another ongoing issue that

has been dealt with on a case-by-case basis but without a long-term strategy. These two important issues, along with the issues associated with small mammals and invertebrates in park facilities highlighted the need for a comprehensive, integrated and long-term strategy to address pest management problems in the monument. Many of the minor infestations can be prevented, thus reducing damage to park resources and the need to use more aggressive treatment methods. In order to address these pest issues the following objectives were developed:

Objectives for this Integrated Pest Management Plan are:

- Prevent infestations of pest species when possible.
- Treat pest species that pose a threat to human health and safety, and to cultural and natural resources.
- Maintain access to monument resources for visitors and staff.

Scope of the Plan

The scope of this document includes guidelines and references for long-term management planning that will reduce the impacts of (or threats from) pests to human health and safety, natural resources protection, and cultural resource preservation within the authorized boundaries of TNM. 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.

Relationship to Other Plans

The Tonto General Management Plan (NPS 2003) includes the following natural and cultural resource objectives, which are pertinent to integrated management planning:

- Exotic species have been identified and controlled.
- Strategy for preserving the archeological, architectural, and structural integrity of prehistoric and historic structures is maintained through periodic site monitoring, focused research, and preservation treatments.

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.

There are a number of federal laws and regulations governing the use of pesticides, animal damage control, exotic organisms and pollution control that must be followed prior to use of many treatment methods and these are listed in Appendix D.

NPS policy dictates that all proposed pesticide use be approved through the Pesticide Use Proposal System where IPM experts review the need for treatment, concur that the most effective treatment method is being used, and to ensure all applicable federal laws and regulations are being followed.

Public Scoping

Scoping is a process to identify the resources that may be affected by a project proposal, and to explore possible alternative ways of achieving the purpose and need while minimizing adverse impacts. Tonto National Monument conducted both internal scoping with appropriate NPS staff and external scoping with the public and interested/affected groups and agencies.

Internal scoping was conducted by an interdisciplinary team of professionals at Tonto on June 2 and July 15, 2010. These meetings included discussions on the purpose and need for the project; various alternatives; potential environmental impacts; past, present, and reasonably foreseeable future projects that may have cumulative effects; and possible mitigation measures. Over the course of the scoping efforts, team members conducted additional site visits to view and evaluate the proposed pest treatments.

External scoping was initiated with the distribution of a scoping letter to inform the public of the proposal to treat invasive species at the monument and to generate input on the preparation of this Environmental Assessment/Assessment of Effect. The scoping letter dated July 6, 2010 was mailed to 18 addressees. Addressees included various federal and state agencies including the Arizona State Historic Preservation Officer, affiliated Native American tribes, and local governments.

During the initial 30-day scoping period, no public responses were received. More information regarding scoping can be found in *Comments and Coordination*.

Impact Topics Retained for Further Analysis

Impact topics for this project have been identified on the basis of federal laws, regulations, and orders; NPS 2006 *Management Policies*; and NPS knowledge of resources at TNM. Impact topics that are carried forward for further analysis in this Environmental Assessment/Assessment of Effect are those where the proposal is expected to have a measurable effect. This information will be used to analyze impacts as compared to the current conditions of the project area in the *Environmental Consequences* chapter. Some impact topics were dismissed from further consideration when the environmental effects were deemed minor or negligible.

Human Health and Safety

In accordance with 2006 *Management Policies* it states that NPS and its concessionaires, contractors, and cooperators will need to provide a safe and healthful environment for visitors and employees. The need to protect human health and safety is the primary reason for this analysis. Employees and visitors are exposed to threats from large hives of aggressive Africanized honey bees. This impact topic will be analyzed in detail because of the potential impacts to human health and safety.

Visitor Use and Experience

According to *2006 Management Policies*, the enjoyment of monument resources and values by people is part of the fundamental purpose of all park units (NPS 2006). The NPS is committed to providing appropriate, high quality opportunities for visitors to enjoy the monuments and will maintain within the monuments an atmosphere that is open, inviting, and accessible to every segment of society.

Further, the NPS will provide opportunities for forms of enjoyment that are uniquely suited and appropriate to the superlative natural and cultural resources found in the monuments. NPS *2006 Management Policies* also state that scenic views and visual resources are considered highly valued associated characteristics that NPS should strive to protect (NPS 2006). Visitors are frequently prevented access to the cliff dwellings due to health and safety risks associated with active and large populations of Africanized honey bees. Dwelling closures result in adverse impacts to visitor use and experience, therefore, this topic will be analyzed in detail.

Park Operations

This term describes the day to day management and operation of the park. The cliff dwellings are the primary feature of the monument and attract an average of 60,000 visitors each year. Currently, the cliff dwellings are frequently closed to visitors and staff due to the risks posed by the presence of large populations of Africanized honey bees; this results in adverse impacts on park operations. Park staff is unable to conduct interpretive tours, routine maintenance, and other necessary tasks during the closures. Substantial staff time is spent monitoring bee and rodent activity levels in and adjacent to the dwellings. IPM issues are impacting park operations. For that reason this impact topic is analyzed in detail.

Archeological Resources

Section 106 of the National Historic Preservation Act, as amended in 1992 (16 USC 470 *et seq.*); the NPS's Director's Order 28 *Cultural Resource Management Guideline*; and NPS *2006 Management Policies* (NPS 2006) require the consideration of impacts on historic properties that are listed, or eligible to be listed, in the National Register of Historic Places. The National Register is the nation's inventory of historic places and the national repository of documentation on property types and their significance. The above-mentioned policies and regulations require federal agencies to coordinate consultation with State Historic Preservation Officers regarding the potential effects to properties listed on or eligible for the National Register of Historic Places.

The NPS, 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. Management decisions and activities throughout the National Park System must reflect awareness of the irreplaceable nature of these resources. NPS will 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. Failure to proactively treat pest species has the potential to adversely affect archeological resources; alternately, the use of chemical pesticides also has the potential to adversely impact archeological resources. Therefore, this topic is of great concern and will be analyzed in detail.

Wildlife

According to the NPS's *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 animals (NPS 2006). When using integrated pest

management treatments on vertebrate and invertebrate species there is the potential to displace desirable species, impact native species, and to unintentionally treat non-target individuals or species. This topic will be analyzed in detail because the proposed actions have the potential to impact wildlife species.

Impact Topics Dismissed from Further Analysis

Some impact topics have been dismissed from further consideration if the impacts would be negligible to minor. The rationale for dismissing these specific topics is stated for each resource:

Soils and Geology

According to the NPS's *2006 Management Policies*, NPS will 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 NPS will strive to understand and preserve the soil resources of monuments and to prevent, to the extent possible, the unnatural erosion, physical removal, or contamination of the soil, or its contamination of other resources.

The chemical with the least harmful side effects would be applied in lowest effective amount possible. No routine spraying of pesticides around buildings in the monument is proposed because that could result in the accumulation of chemicals in the soil. Pesticides that are sprayed would be directly applied to the target, such as a bee hive. While there may be residual left on the rock face, it is not anticipated that it would eventually accumulate in the soil in measurable levels. Any pesticides applied in bait would only be applied to active burrows in order to ensure all hot bait is consumed and not left to accumulate in the soil. Burrowing animals impacting archeological sites and park facilities would be treated under the proposal to reduce soil disturbance.

It is anticipated that because all pesticides would be applied under stringent conditions using the least amount of pesticide, the impacts to the soil and geology resources would be minor or less. No accumulation of pesticides is expected under either alternative, and soil disturbance may be reduced.

Vegetation

According to the NPS's *2006 Management Policies*, the 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). Currently, there are no pest populations that are so large that they are causing an impact on the vegetation of the monument through consumption or trampling. There could be a reduction in pollinators for plant species from the treatment of Africanized honey bees. Not all bees in the monument would be treated and bees are known to travel 1-3 miles, so it is not anticipated that there would be measurable impacts to plant species from bee treatments. Cultural methods such as clearing vegetation from around buildings would result in a negligible to minor adverse impact as this practice would only be done in the vicinity of park buildings. No clearing would take place in the natural areas of the monument. Impacts are predicted to be negligible to minor, and therefore this impact topic has not been analyzed in detail.

Special Status Species

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 NPS to examine the impacts on federal candidate species, as well as state-listed threatened, endangered, candidate, rare, declining, and sensitive species (NPS 2006).

The Mexican Spotted Owl was sighted once in TNM, and the Bald Eagle is sighted occasionally. Neither species is known to nest or spend much time in the monument as it lacks suitable habitat. The reduction of rodent species is targeted to problem species in the dwellings or park facilities and would not significantly reduce the rodent prey base for owls and eagles. No other threatened, endangered or sensitive species are known to occur in the monument. No state listed species are expected to be impacted by the alternatives. While invertebrate bee populations would be reduced, not all bees would be eliminated. Any treatments done to protect park facilities are not expected to reduce the prey base for insectivores. There are no impacts to special status species anticipated from proposed alternatives and therefore this topic is not analyzed in detail.

Wetlands/Floodplains

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 of dredged or fill material or excavation within waters of the United States. NPS 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. There will be no adverse impacts to wetlands as described in DO77-1 and no Statement of Findings has been prepared.

Executive Order 11988 *Floodplain Management* requires all federal agencies to avoid construction within the 100-year floodplain unless no other practicable alternative exists. NPS *2006 Management Policies* and Director's Order 77-2 *Floodplain Management* will 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. There will be no net loss of floodplains and no construction in these areas. Therefore a Statement of Findings for floodplains will not be prepared.

Cave Canyon at Tonto NM provides mesic habitat for a number of species. Standing water accumulates in Cave Canyon intermittently throughout the year and may attract pest species. The proposed treatments would not impact the condition or function of the riparian habitat and channel. Impacts to wetlands and floodplains would be negligible and this topic has been dismissed from further analysis.

Water Resources

NPS 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. Cave Canyon at Tonto NM is an ephemeral stream that provides important riparian habitat. Standing water does accumulate in Cave Canyon intermittently throughout the year and may attract pest species. Should pest species be identified in the canyon, it would be a high priority for treatment. Treatments would be carefully applied following a number of mitigation measures to reduce potential impacts. If pesticides are determined to be the most effective treatment, the least amount of the least toxic chemical would be applied, minimizing chemical drift. Impacts to water resources from the proposal would have negligible to minor impacts in the 'worst case' scenario. Therefore, water resources have been dismissed from further analysis.

Historic Structures

The term "historic structures" refers to both historic and prehistoric structures, which are defined as constructions that shelter any form of human habitation or activity. The project area contains several historic and prehistoric structures that are eligible for the National Register of Historic Places. For the purpose of this Environmental Assessment/Assessment of Effect, only structures containing standing architecture will be discussed in this section while ephemeral prehistoric sites will be addressed below under archaeological resources.

The visitor center at TNM is eligible for the National Register. There have been termite treatments and infrequent invertebrate treatments in the visitor center in the past. Treatments were applied prior to the completion of the determination of eligibility. Termite treatments have been highly effective and a number of preventative measures were implemented. Should additional treatments be necessary within the visitor center, measures would be taken to negate impacts. Proper compliance under §106 of the National Historic Preservation Act would be followed for those structures listed or eligible for the National Register of Historic Places. A Cultural Resource Specialist would be notified in advance about the proposed procedures, and present at the time treatment occurs. In addition to using the least toxic chemical possible, mitigating measures could include the use of protective plastic, point (versus spray) application near historic structures, or mechanical removal. Pest treatments would be designed to preserve and protect the historic character defining features. Because treatments would have a negligible impact on historic structures, this topic will not be analyzed in detail.

Paleontological Resources

According to *2006 Management Policies*, paleontological resources (fossils), including both organic and mineralized remains in body or trace form, will be protected, preserved, and managed for public education, interpretation, and scientific research (NPS 2006). TNM contains no paleontological resources; the geologic formations in the monument have not been conducive to their formation. Therefore, there are no impacts to paleontological resources as a result of this proposal and they will be dismissed from further assessment.

Ethnographic Resources

Per the NPS's 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, NPS should try to preserve and protect ethnographic resources.

There has been no formal ethnographic survey conducted in the monument. Treatments are designed to maintain natural states and preserve existing prehistoric and historic structures and so will ultimately help protect ethnographic resources. Therefore, this topic has been dismissed from further consideration.

Cultural Landscapes

According to the NPS'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. Although a formal cultural landscape inventory has not been conducted for the monument, all activities will be conducted in such a manner as to preserve the existing landscapes and avoid impacting currently unknown cultural landscapes. As a result, this topic has been dismissed from further consideration.

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). The objective for IPM in museum collections is to prevent any impacts from pest species. Museum collections are inspected on an annual basis and all handling of these artifacts is done in accordance with the Western Archeology and Conservation Center (WACC) policies and this has proven to be an effective preventative method. If an infestation is discovered it would follow the same policy guidelines and no treatments would result in more than minor impacts to the resources. Since the impacts to museum collections are negligible, and in the worst case scenario would be minor, this impact topic is being dismissed from detailed analysis.

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 NPS units. Section 118 of the Clean Air Act requires a monument to meet all federal, state, and local air pollution standards. Tonto National Monument is designated as Class II air quality areas 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. The use of pesticides could result in chemical drift. However, treatments would only be applied under acceptable wind conditions. As with the use of any chemical, there is the potential for it to get into the air. The least harmful and the least amount of pesticide would be used for treatments and only under the correct weather conditions. The impacts to air quality are predicted to be short-term and minor or less. Consequently, this topic has been dismissed from detailed analysis.

Soundscape Management

In accordance with *2006 Management Policies* and Director's Order 47 *Sound Preservation and Noise Management*, an important component of the NPS's mission is the preservation of natural soundscapes associated with national park units (NPS 2006). 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 monuments, 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 NPS units as well as potentially throughout each monument, being generally greater in developed areas and less in undeveloped areas. The impacts of integrated pest management are not expected to impact the soundscape of the monument; this topic is dismissed from further analysis.

Lightscape Management

In accordance with *2006 Management Policies*, NPS strives to preserve natural ambient lightscapes, which are natural resources and values that exist in the absence of human caused light (NPS 2006). Lights serve to attract a number of unwanted pest species. Tonto NM strives to limit the use of artificial outdoor lighting to that which is necessary for basic safety requirements. This proposal would not impact lightscape management and this topic has been dismissed 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 communities that include Roosevelt and Punkin Center, Arizona. There may be minimal increases in employment opportunities and revenue generated from this project. Any increase in workforce and revenue 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. There are no prime and unique farmlands designated in the monument and this topic 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 the 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 at Tonto National Monument. The lands comprising the monument 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 missions 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 would not have disproportionate health or environmental effects on minorities or low-income populations or communities. Therefore, environmental justice has been dismissed as an impact topic in this document.

ALTERNATIVES

Alternatives Considered

Alternatives were framed through discussion among NPS staff from: Tonto National Monument, Southern Arizona Monuments, Intermountain Region, and Washington Offices; Carl Hayden Bee Institute, International Pest Management Institute, and private contractors. The alternatives cover the range of what is physically possible, acceptable by policy, and feasible for local managers; i.e. all reasonable alternatives. Criteria used in the selection of reasonable alternatives include:

- Prevent infestations of pest species when possible.
- Treat pest species that pose a threat to human health and safety and cultural and natural resources.
- Maintain primary monument resources open to visitors and staff.
- Effectiveness, efficiency, and economy in eradicating or controlling pest populations.

Two reasonable alternatives, or those alternatives that are economically and technically feasible, were then identified. These two alternatives were then carried forward. Tables 2 and 3 provide a comparison of the two reasonable alternatives analyzed in this Environmental Assessment/Assessment of effect with regards to project objectives, actions to accomplish those objectives and potential environmental impacts to resources.

The alternatives propose to use different approaches, reactive vs. proactive, different treatment methods and different combinations of treatment methods. For the purposes of this document, following is a brief definition of each treatment type:

- **Cultural Treatments:** Cultural treatments promote native, non-pest species, and prevent opportunities for pest species to establish and grow. Cultural methods include: sanitation, removing clutter, vacuuming, proper trash disposal and other habitat alterations. They also include inspecting HVAC systems and outdoor faucets to reduce water availability, and reducing the use of lights at night that attract pests. Exclusion of pest species from buildings is also considered a cultural treatment, these methods are similar to weatherproofing a building and include: door sweeps, caulking, weather stripping, and other techniques to fill in cracks and crevices where pest species can enter buildings.
- **Mechanical Treatments:** Physical removal/elimination or erecting physical barriers to exclude the individual or population of the pest species. Treatments include: filling in burrows, live trapping, shooting, heat and cold treatments, and some forms of exclusion.
- **Chemical Treatments:** Applying chemicals as prescribed by their labels using a variety of application methods. Some chemical treatments are considered 'low risk' such as, diatomaceous earth applications to bee hives and soapy water applications directly on bees. Other chemical treatments may include: pesticides that result in direct mortality of the pest, and pheromones that attract pest species to a trap for elimination. Examples of application methods include: portable sprayers, bait treated with pesticide, pheromone traps, and other methods.

- **Biological Treatments:** Bio-control includes the use of 'natural enemies', such as insects, microorganisms, and predators. Natural enemies are imported from an area where it naturally occurs with the target species and is deliberately released in to areas where the pest is a problem. Predators such as domestic cats may be viable form of treatment for rodents in and near buildings.

Alternative 1: No Action, Continue with Current Management Program

Under this alternative the park would continue to manage pest species using current treatments, and action would be taken only in response to a known threat. Proactive, preventative measures would not be emphasized. Treatments of pests such as Africanized honey bees would continue on a limited basis – in response to emergency situations, rather than applied as part of a long-term solution. Resource managers would be limited to those treatment options that qualify as a Categorical Exclusion (CE) where impacts are determined to be minor or less. Treatments that qualify under CE regulations include cultural and some mechanical treatments, and chemical treatments only in response to emergency situations.

Snap traps to remove rodents in park buildings known to have infestations would continue. Termites would be treated when damage is observed. Sanitation practices such as keeping kitchens and office spaces clean would continue. No routine treatment of invertebrates in buildings would be conducted. Pest exclusion would occur as problems are identified, but there would be no routine inspections or preventative measures. There would not be any habitat removal around the outside of park buildings.

Risk Assessment

Park staff assesses the risks posed by Africanized honey bees in the vicinity of the cliff dwellings at least once a day, and some days when shifts change or there is high activity it may be done more frequently. The assessment is done using a modified Severity Probability Exposure (SPE) model. The SPE documents the number of bees leaving the most active hive per minute, number of active hives, number of visitors, air temperature and wind speed in order to come up with a quantitative assessment of the risk posed by the bee hives (Appendix B). The results of this assessment help guide park staff to determine if the risk level is low enough to allow visitors and staff to visit the cliff dwellings.

Education Programs

Public education activities would continue at the monument. Visitors are advised not to feed wildlife. Visitors are also educated on the presence and potential risks associated with the Africanized bee populations in the vicinity of the cliff dwellings. Visitors who are sensitive and/or prone to anaphylactic shock are advised not to go to the dwellings. The park has an Africanized Honey Bee Safety Plan (Appendix C). All staff members are familiar with the plan and trained in emergency response techniques in the event of a bee sting or attack.

Collaboration Measures

Because of the ongoing issues related to Africanized honey bees, the monument continues to seek the advice and expertise from a number of sources. NPS IPM staff at the Regional and Washington level are regularly consulted. IPM staff have provided recommendations on general IPM practices, bee treatment methods, and experts to contact. IPM staff have approved all treatments prior to implementation in the NPS Pesticide Use Proposal System (PUPS) database. Staff from the Carl Hayden Bee Institute have conducted site visits and provide responses to issues and questions on a regular basis. A number of pest treatment contractors have been contacted seeking advice. Staff from USDA Animal and Plant Health Inspection Services (APHIS) have been consulted regarding vertebrate pest issues.

Planning

The monument would continue to implement and update the Africanized Honey Bee Safety Plan, remove rodents causing damage to the cliff dwellings, and trap rodents in park facilities. The monument would continue to respond to emergency situations, but not develop a long-term plan on how to effectively prevent pest issues and how to effectively treat recurring pest problems.

Treatments

- **Cultural Treatments** - The monument would continue to implement limited cultural treatments that remove food and habitat for pests. These practices include proper waste disposal and keeping kitchen office areas clean. Exclusionary devices may be installed in park facilities if a pest entrance is identified.
- **Manual/Mechanical Treatments** - The monument would continue to implement limited mechanical treatments such as snap trapping small rodents in buildings and live trapping rodents in cliff dwellings.
- **Biological Treatments** - No biological treatments are proposed for use under this alternative.
- **Chemical Treatments** – Low risk chemical treatments (diatomaceous earth and soapy water) could be applied to bee hives. The monument is currently applying pesticides only when pest populations or individuals are causing ‘emergency’ situations such as Africanized honey bee populations causing closure of the cliff dwellings, or rodents causing irreparable impacts to the original fabric of archeological resources. PI Contact is being used to treat bee hives within 50 meters of the lower cliff dwelling and access trail. Pheromones are being used in 20 swarm traps to attract swarming bees to try to prevent their establishing additional hives in the vicinity of the cliff dwellings. Swarm traps are placed 50-100 meters away from the cliff dwellings and trails, and as far away from visitor use areas as possible. Chemical treatments would continue to be used in emergency situations when active Africanized bee hives threaten human health and safety. Nuvan® pest strips would be placed in the vicinity of active hives.
- The current species being treated include: Africanized honey bees, termites, wasps, invertebrates inside park facilities, and rodents in buildings. Table 1 lists chemical treatments currently approved for use in 2010.

Table 1: Pesticides Approved for use in TNM for 2010

Product Name	EPA Reg. #	Purpose	Method	Pest
AIR-DEVIL® HPX	9444-182	Public health	Aerosol Can	HONEY BEES
TEMPO®1% DUST INSECTICIDE	432-1373	Public health	Crack & Crevice	HONEY BEES
APICIDE®	36272-14	Public health	Crack & Crevice	HONEY BEES
P.I. CONTACT® INSECTICIDE	499-444	Public health	Aerosol Can	BEES
PROZAP® INSECT GUARD	5481-338-36208	Employee/Visitor Safety	Crack & Crevice	BEES
TERMIDOR® 80 WG	7969-209	Structural	Crack &	TERMITE

		Protection	Crevice	S
WASP FREEZE® PT515 (2)	499-362	Employee/Visitor Safety	Aerosol Can	WASPS
OFF SKINTASTIC® (PUMP)	4822-395	Personal comfort	Other	BLACK FLIES
AMDRO® FIRE ANT BAIT	73342-1	Structural Protection	Bait	ANTS

Wasp Freeze®, Off Skintastic®, and Amodro® are commercially available products and are used infrequently on an as-needed basis in the monument. Termidor® is a termite treatment product that has been used to treat termites in park buildings. Termidor® must be applied by a licensed applicator.

Prozap Strips® have been used in the past to treat bee hives within the monument. Although they are still commercially available, they are no longer approved for use by NPS. PI Contact®, Apicide®, and Air Devil® have been used in the past. Apicide® is more suited to applications in structures to reduce invertebrate populations. Air Devil® has specifically been approved for use in cracks and crevices around the cliff dwellings. PI Contact® is approved for broader use by NPS when directly treating active hives.

PI Contact®. PI Contact® has been the most frequently applied pesticide for treatment of bee hives and will be used in the determination of environmental effects in this document. Information presented here is taken from: EXTOWNET, Extension Toxicology Network, and Cornell University. The active ingredients in PI Contact are natural pyrethrins. These are natural insecticides derived from the chrysanthemum flower. There are two types of pyrethrins (called I and II) that are derived from the flowers and are combined in PI Contact for more effectiveness. Natural pyrethrins are contact poisons which act quickly to penetrate the nervous system of the insect. A few minutes after the application the insect cannot move or fly away. Research shows that rats and rabbits are not affected by large doses of pyrethrins. Tissue storage has not been recorded in mammals. Animals fed large doses may experience liver damage. Pyrethrins are extremely toxic to aquatic species, and slightly toxic to bird species. Pyrethrins are considered one of the least toxic insecticides to mammals. When exposed to light and air, natural pyrethrins are readily inactivated and decomposed.

Air Devil®. Air Devil® is specifically approved only for use in cracks and crevices that can only be reached using a pole with the aerosol can attached. Air Devil contains one synthetic pyrethrin compound. Affects from Air Devil® are similar to PI Contact® (described above) that uses two natural pyrethrins and Tempo® (described under Alternative 2) that uses two synthetic pyrethrin compounds.

Termidor®. The active ingredient in Termidor® is fipronil. Information is from: National Pesticide Information Center, Oregon State University, Corvallis, OR. Fipronil disrupts the normal function of the central nervous system in insects. It is more toxic to insects than to humans and other mammals because it is more likely to attach to insect nerve endings. Fipronil has not been shown to be carcinogenic in humans.

Monitoring and Record Keeping

Currently the park is focused on monitoring Africanized honey bee activity and rodent activity in and near the cliff dwellings. Park staff count the number of bees exiting or entering each hive per minute to determine the general activity of the hives and to track trends of each hive over time, on a weekly basis. This information is also used to determine the effectiveness of emergency treatments. At the Lower Cliff Dwelling, park staff record use the SPE model to determine general activity and risks related to bee hives at least once a day, if not more often. Park staff conducts visual inspections of the cliff dwellings every day for signs of rodent burrowing, and wildlife cameras are set in dwellings to look for signs of rodent activity.

Alternative 2: Preferred Alternative – Full use of Integrated Pest Management techniques (mechanical, cultural, chemical, and biological control) to manage pest species

The preferred alternative proposes to use a proactive, integrated pest management (IPM) approach to control pest species in the monument. The NPS has a mandate to ensure human health and safety, preserve natural and cultural resources now and for future generations, as well as to provide opportunities for visitor enjoyment. The differences between this alternative and current management (Alternative 1) is that the park would be proactive in its response to pest species and could use chemical treatments on a more frequent basis, primarily for Africanized honey bees.

IPM is a decision making process that supports the NPS mission by coordinating knowledge of pest biology, the environment, and available technology to prevent unacceptable levels of pest damage, using environmentally sound, cost-effective management strategies that pose the least possible risk to people, park resources, and the environment. This process helps the resource manager determine whether the treatment is necessary and appropriate, where treatment should be administered, when treatment should be applied, and what strategies should be used for immediate and long-term results. IPM is done on a case-by-case basis, so that treatment strategies are tailored to local conditions. Each exotic plant's natural history is also evaluated before developing treatment strategies. The goal of IPM for this project is therefore to manage pest species and the environment to balance costs, benefits, public health, and environmental quality. IPM employs multiple integrated management practices rather than a single solution, wherever technically and economically feasible. An integrated approach is often more effective than a single type of treatment. Integrated management practices that would be included under the preferred alternative include using an interdisciplinary team to evaluate the need for treatment using the Decision Tool described at the end of this section. The process involves evaluating the use of all possible treatments methods, or combination of treatment methods, that would result in the most effective results. Treatment methods include: cultural, mechanical, biological and chemical. The Decision Tool also requires a 'feed-back loop' where follow-up monitoring and evaluations are conducted.

The current species being treated include: honey bees, termites, wasps, invertebrates inside park facilities, and rodents in archeological sites and buildings. However, this alternative would allow for the treatment of additional species should they become a problem. An Interdisciplinary Team (IDT) would be convened to go through the Decision Tool for treatment options in order to determine the threshold(s) for treatment of that species, appropriate treatment methods and if there is proper NEPA and Section 106 compliance.

Risk Assessment

Park staff would continue the Risk Assessment process at least once a day or more, similar to Alternative 1, to determine the activity level of Africanized honey bees in the vicinity of the cliff dwellings and evaluate the risk to visitors and staff. Park facilities would be inspected on a regular basis to identify the presence of pests, and to identify needed maintenance and repairs to prevent pest species.

Education Programs

Education under Alternative 2 would be similar to Alternative 1. Public education activities would continue at the monument. An emphasis on educating visitors on the presence and potential risks associated with the high Africanized bee populations in the vicinity of the cliff dwellings would continue. The Africanized Honey Bee Safety Plan would continue to be implemented and modified as necessary. All staff would be familiar with the plan and trained in emergency response techniques in the event of a severe bee attack.

Collaboration Measures

Ongoing collaborative measures would continue similar to Alternative 1. Staff would continue to stay informed on the latest developments in integrated pest management. There could be enhanced cooperation with the Intermountain Region and Washington IPM staff, USDA APHIS, Carl Hayden Bee Institute, other parks with similar problems, universities, and contractors with IPM experience as the monument strives to implement more pest prevention measures, implement treatments prior to the individual/population causing emergency situation(s), and more integrated methods to prevent and reduce pest populations.

Planning

Under the preferred alternative, resource managers would use the following Decision Tool described below for pest management planning. In using this tool park managers would follow a decision-making process to identify pest species, determine pest species that meet action thresholds within the appropriate management zone, identify and evaluate the efficacy and environmental effects of the proposed treatment, consider alternative treatments having less impacts, justify why a treatment was selected, and confirm compliance with applicable policies and regulations. Resource managers would also be able to use the results to explain to the public how each of these factors was accounted for in selecting treatment methods.

Treatment

Under the preferred alternative, the following treatment methods are proposed to manage pest species:

- **Cultural Treatments** - Cultural treatments are similar between the two alternatives, except routine inspections and monitoring to ensure effectiveness of cultural treatments would be conducted under this alternative. Preventative measures are stressed under this treatment type such as: proper sanitation in kitchen and office areas, exclusion meaning filling cracks and crevices in buildings, removal of garbage, removal of clutter and materials that could be used as nesting or food sources, and removal of vegetation adjacent to some park facilities to reduce pest habitat.
- **Mechanical Treatments** - The monument would continue to implement mechanical treatments such as snap trapping small rodents in buildings and live trapping rodents in cliff dwellings. Any pest species that are live trapped would be properly euthanized. Other techniques include the removal of vegetation and food sources around buildings. An additional mechanical treatment proposed under this alternative is to maintain and fill

the cracks and crevices in the vicinity of the cliff dwellings that have been filled in the past, in order to eliminate existing hives and prevent future re-colonization.

- **Biological Treatments** - Alternative 2 would allow for the use of biological control methods, provided an appropriate method is available. Biological control relies on the use of other biological organisms to maintain pest population below the action thresholds. In some cases habitat for natural predators is enhanced, in other cases organisms are released that specifically target the pest species and result in reduced vigor and/or death. At this time, there are no known biological control agents for priority pest species at TNM. However, should biological control agents become available, they will be considered for use provided their effects are similar to or less than those disclosed in this document. If not, additional NEPA compliance would need to be conducted.

Only biological control agents that have been approved by APHIS for release on federal lands in Arizona could be used under the preferred alternative. When considering the use of a new biological control agent, the resource management specialist would confirm that its use is necessary and that all other treatment options are either not acceptable or not feasible. In making this determination, resource managers would contact specialists at APHIS who have studied the biological control agent. Consultation with the US Fish and Wildlife Service is also required to ensure that no non-target species in the area could be impacted.

The resource manager must confirm that use of the selected biological control agent is appropriate for their site, that it has the potential to be effective, and that populations would be viable. Taking these extra steps would help to ensure that the most appropriate and cost-effective biological control agent is selected. Before a biological control agent is released, the resource manager would receive approval from the National IPM Coordinator. If biological control agents would be obtained from another state, a permit must also be obtained from APHIS. The transport, handling, and release of biological control agents would be in accordance with all permit conditions. Parks would use a standardized form to report annual releases of biological control agents to the Regional IPM Coordinators.

- **Chemical Treatments** - The use of chemical treatments is the primary difference between the two alternatives. Currently, chemical treatments are only used in response to unacceptable levels of infestation such as when termite damage is discovered in buildings, or when Africanized honey bee populations reach levels that threaten human health and safety. Under Alternative 2, chemical treatments could be used on a more frequent basis to prevent infestations or to reduce populations of species before reaching emergency levels. For example, bee hives in the vicinity of the cliff dwellings and park facilities may be treated on a more routine basis. Pheromones in traps would be used to attract swarming bees on a regular basis. All chemical applications would address the need to protect human health and safety, cultural resources and monument facilities, as well as allowing visitors to enjoy the primary resources of the monument.

Chemical treatments may be applied in different forms, including but not limited to: treated bait, spray, liquids that are brushed on a surface, pest strips, and powders. Spray treatments would specifically target an identified pest such as an ant colony or bee hive. No broadcast spraying of pesticides would be allowed. Treatment of hives in the vicinity of the cliff dwellings may entail the use of extension ladders and aerosol cans

mounted on the end of long poles to reach some hives. In other instances, contractors certified in pesticide application and rappelling would rappel down the faces of the cliffs adjacent to the dwellings and apply pesticide directly on the hives, minimizing the potential for pesticide drift.

Pesticides could be used on a regular basis to address Africanized honey bee issues. Pesticides may be used to address rodent problems in cliff dwellings and other archeological sites if mechanical methods prove ineffective. Pesticides may be used to protect monument building and facilities from pest species such as termites and other invertebrates. Preventative pesticides, such as boric acid to prevent termites, would be used if determined to be the most effective means of treatment. No chemical treatments would be applied without prior approval from regional or Washington IPM staff in the PUPS system. A summary of pesticides currently being used in the monument is provided in Table 1.

Low risk pesticides such as, diatomaceous earth and soapy water would be available for use. Other pesticides that may be used, in addition to those listed in Table 1 include: Tempo® for honey bees and zinc phosphide for rodents. Tempo® and zinc phosphide are described here as they are currently the most effective treatments for honey bees and rodents, respectively. The impacts of Tempo® are greater than the other apies proposed for use and therefore represent the worst-case scenario. Their effects are used to describe the impacts in this document and to serve as benchmark for comparison of other pesticides. Other pesticides not listed here would be considered for use within the monument provided their environmental effects are similar to or less than those described here.

Tempo® – Tempo® is an effective pesticide. PI Contact® would be the most frequently applied pesticide to treat bees and it is described under Alternative 1. Tempo® would be available for use under Alternative 2 to be used in conjunction with mechanical/cultural exclusion methods. Cracks and crevices in the vicinity of the cliff dwellings that have been previously treated would be resealed and re-treated with Tempo® to kill off the hive and prevent future access. Tempo® is a synthetic form of pyrethrin. The synthetic pyrethrin compounds break down much slower than the natural pyrethrins used in PI contact.

The active ingredient in Tempo® is beta-cyfluthrin. Beta-cyfluthrin is highly toxic to fish and aquatic invertebrates, and presents a high risk to honey bees and other insect species. Tempo® is approved for indoor use. The primary difference between PI Contact® and Tempo® appears to be that the synthetic pyrethrins last longer in the environment than those that are naturally derived. Tempo® is considered non-toxic to mammals, including humans.

Zinc Phosphide – Under this alternative, zinc phosphide may be used when cultural and mechanical treatments have failed to remove specifically targeted rodents from the cliff dwellings, park facilities, and other identified archeological resources. Zinc phosphide would only be applied by licensed applicators from APHIS. These treatments will be applied only after an IDT completes the Decision Tool process described below. The burrow(s) would be pre-baited with untreated rolled oats for two or three days to ensure the burrow is active and the individual(s) will eat the oats. The oats will then be treated with the prescribed amount of zinc phosphide and placed at the burrow entrance.

The burrow(s) will be monitored for three days following treatment to ensure no poisoned rodents are found above ground.

Zinc phosphide (Zn_3P_2) is one of the most widely used rodenticides throughout the world. It is a restricted-use pesticide meaning it can be purchased and used only by certified applicators. Zinc phosphide is often recommended for rodent problems as it is fairly specific to rodents. When ingested zinc phosphide has an emetic effect, causing the animal to vomit. Since rodents are not able to vomit, zinc phosphide is particularly toxic to this class of animals. After ingestion, zinc phosphide converts to phosphine gas which is absorbed into the bloodstream to adversely affect the lungs, liver, kidneys, heart, and central nervous system (Staples et al 2003). It rapidly degrades in the moist acidic gastro-intestinal tract of poisoned animals. Zinc phosphide is not stored in muscle tissue or bone thus there is little risk of accumulation in the food chain and greatly reduced risk of true secondary poisoning (Staples et al 2003). Secondary poisoning occurs when a predator becomes sick or dies from ingestion of treated prey.

Birds appear to be particularly sensitive to the emetic effect of zinc phosphide and regurgitate upon ingestion. Studies show zinc phosphide is 2-15 times more toxic to rodents than to carnivores. Carnivores avoid prey that has been treated with zinc phosphide if other sources of food are available (Johnson and Fagerstone 1994). It is speculated that treated prey give off an offensive odor to predators.

Johnson and Fagerstone (1994) examined the results of 61 acute oral toxicity studies, representing 28 species of mammals and 16 species of birds conducted on zinc phosphide. In-depth analyses are included in their publication. They conclude that zinc phosphide is one of the safest rodenticides available. Field studies have generally found no significant effects of zinc phosphide on non-target wildlife. The incidents that did involve toxicity to non-target species generally involved misuse of the product, or application at rates much higher than label directions.

Monitoring and Record Keeping

Monitoring of all known current infestations, known areas of pest habitats, and past infestations would be conducted on a regular basis. The park will continue with its current determination of risk based on the use of a modified "Severity Probability Exposure (SPE)" model. Staff will evaluate the level of bee activity and other risk factors at least once a day to determine if factors indicate whether the dwellings should be opened or closed. Record keeping and reporting the use of pesticides would be in compliance with NPS guidelines in the PUPS database.

All pesticides used by the monument are registered by the U.S. Environmental Protection Agency. The monument will obtain approval from either the Regional or National IPM Coordinator before using any pesticides, including the use of the PUPS tracking system.

Decision Tool for Integrated Pest Management

Under Alternative 2, the following Decision Tool will be used to evaluate the need for treatment, the least impacting treatment(s), cost effectiveness, and to ensure all required compliance is completed:

1. Identify Pest Species that Meet Action Thresholds

This Decision Tool is used to establish pest management objectives and to identify pest species that meet the action thresholds for treatment within different zones in the monument. A management objective is a desired state of the system that the resource manager wants to achieve. Management objectives should be measurable since they will be used to evaluate the effectiveness of various exotic plant management treatments. The general management objectives for this project are to prevent threats to human health and safety and to prevent adverse impacts to cultural and natural resources, using environmentally sound, cost-effective management strategies that pose the least possible risk to people, park resources, and the environment.

IPM objectives:

- Prevent infestations of pest species when possible.
- Treat pest species that pose a threat to human health and safety, and to cultural and natural resources.
- Maintain primary monument resources open to visitors and staff.

IPM Zones:

Different zones have been identified in the monument based on the level of risk to human health and safety, and on the risk to cultural resources from pest populations. Within these zones different action thresholds have been identified.

- Administrative Facilities = Low tolerance for human health and safety risks or for facility damage. This zone covers all park administrative buildings including: offices, the visitor center, park housing, maintenance facilities and the picnic area. Examples of pest species that would meet an action threshold in administrative buildings include: rodent(s) (because of the risk of Hanta Virus and damage to property), termites (because of the damage to park facilities), and invertebrates (such as ants and scorpions found in buildings). Africanized honey bees would be treated immediately in the vicinity of park administrative areas and residences. Species normally considered pests might not always be treated if there is no evidence of damage or large populations such as a few ants, an occasional roach, or other invertebrates that can be removed from the building.
- Cliff Dwellings = Low tolerance for human health and safety risks or for facility damage. This zone encompasses the cliff dwellings and trails. For example, the presence of one rodent could trigger treatment because of the damage they cause by burrowing into original materials of the cliff dwellings. Park staff monitor the dwellings in a regular basis. The park cultural resource specialist will determine if and when rodent treatments are necessary. The presence of low numbers of Africanized honey bees that are not swarming may be considered acceptable (as defined in the SPE model), while certain weather conditions or high bee activity levels may trigger treatment.
- Backcountry Cultural Resource Sites = The 68 sites in the monument's Archeological Sites Management Information System (ASMIS) database comprise known backcountry cultural resource sites, and the three primary cliff dwellings. An IDT would be convened to determine level of impact and the need for treatment/ treatment. For example, one or a few rodent burrows on a cultural resource site (excepting the cliff dwellings) may not be targeted for treatment, depending on impact severity. However, if multiple burrows are identified then treatment may be applied if the IDT determines unacceptable levels of impacts to cultural resources. Unacceptable impacts would include burrowing into original fabric of prehistoric dwellings, bringing artifacts to the surface, or rodents nesting

in walls. The presence of Africanized honey bees may be acceptable unless staff will be working in the area for extended periods of time. If there is a potential risk to staff they will review the SPE model to help determine the level of risk and need for treatment of the hive. In cases where the SPE model indicates a risk to humans, hives may be treated for the time period when the work is being conducted.

- Natural Resources = This zone covers the entire monument, excluding the zones previously defined. If pest problems are identified that have a potential to impact natural resources, an IDT would be convened to determine the level of impact. For example, a few rodent burrows may be acceptable. A high density of rodent burrows resulting in soil erosion on the steep slopes within in the viewshed of the cliff dwellings may trigger treatment. These impacts will be determined by the IDT on a case-by-case basis.

2. Determine if all appropriate prevention measures have been implemented.

Cultural methods and mechanical treatment methods are economical, low impact methods to prevent adverse impacts from pest infestations. Pest species can often be eradicated using cultural treatment methods including: proper sanitation, proper disposal of garbage, and sealing buildings. Mechanical treatments such as exclusion of pests by resealing previously sealed cracks in the cliffs and by filling in burrows to discourage re-habitation are important forms of pest prevention. The pest species and location must be carefully evaluated to determine that all possible preventative measures have been implemented prior to treatment. Some relatively benign chemical treatments such as boric acid help prevent termites. Preventative and low risk methods would always be considered first. In the event that these methods are ineffective, additional treatment methods including pesticides would be considered for use.

3. 'Minimum' tool analysis for treatment options.

The IPM minimum tool analysis is based on the concept of Minimum Requirement Decision Guide that is used by the NPS to evaluate activities in Wilderness areas. The IDT identifies a pest issue. The IDT then looks at the level of infestation, resource impacts, and risks to human health and safety in order to determine if treatment is necessary. The team evaluates possible treatment methods, potential costs, treatment effectiveness and available resources. The IDT discusses whether there are any other treatment options, treatment agents, or application methods available that would result in lower impacts when compared to the proposed treatment option. Given this analytical process, the ID team selects the most effective treatment with the least impacts.

If management objectives are not met, the selected treatment may be modified, or alternative treatments may be considered through adaptive management. Adaptive management recognizes that knowledge about natural resource systems is sometimes uncertain and is the preferred method of management in these cases.

4. Prior to implementing treatments, confirm that the proposed treatments meet all compliance needs (NEPA, Section 106 and Section 7, etc.) and applicable regulations and policies.

If chemicals or biological control agents are to be used, the resource manager must confirm that these treatments are justified and compliant with NPS policies using this decision tool. According to the NPS Management Policies (2006:48), a designated IPM specialist must first determine that the use of a chemical or biological control agent is necessary. In addition, all other treatment options considered must be either not acceptable or not feasible. If the use of

chemical or biological control agents has not been determined necessary, or if there are other treatment options that are acceptable or feasible, the resource manager must reconsider their use. Prior to implementing the selected treatment, the Resource Manager must confirm that the selected treatment method has the necessary compliance with NEPA. The resource manager would use an Environmental Screening Form to confirm that the selected treatment method and the level of environment effect has been analyzed in this EA. The manager would further confirm that the predicted level of environmental effect of the treatment is similar to or less than the effects disclosed in this EA.

- **Chemical Control Compliance**

In accordance with NPS-77 (NPS 1991), only those pesticides that are registered by the USEPA can be used. Pesticides must also be used in accordance with product labels. Some pesticides have use restrictions that prohibit their use under certain conditions. For example, some pesticides can only be applied on federal lands by licensed APHIS applicators. Pesticides having use restrictions would only be used for sites that meet the conditions specified on the product label. If the pesticide is registered, and if there are no existing site conditions that would restrict its use, the next step is to submit a pesticide use request to the Regional and/or National IPM Coordinator. In general, herbicide use proposals from parks are submitted to the Regional IPM Coordinator, who is responsible for soliciting input from the National IPM Coordinator for cases where the Regional Coordinator does not have approval authority.

- **Biological Control Agent Compliance**

Only biological control agents that have been approved by APHIS for release would be used under the preferred alternative. If a biological control agent has not been approved by APHIS, resource managers must consider other treatments using the Optimum Tool Analysis. APHIS undergoes an extensive review process prior to approving any biological control agents for release in the U.S. The next step is to submit a biological control agent use request to the Regional IPM Coordinator. Once the biological control use request has been approved by the National IPM Coordinator, the resource manager can then identify a procurement source for the biological control agents. If biological control agents would be obtained from another state, a permit must be obtained from APHIS. The transportation and handling of biological control agents would necessarily comply with any conditions specified in this permit.

Alternatives Considered and Rejected

Two additional alternatives were identified and considered in the scoping process. They were determined to be ineffective within the context of NPS policies (Director's Order 12, Section 2.7B) and were therefore eliminated from further analysis. Section 2.7B identifies as unreasonable those alternatives that could not be implemented if they were chosen, that cannot be implemented for technical or logistical reasons, that do not meet monument mandates, that are not consistent with management objectives, or that may have severe environmental impacts.

Swarm Traps for Bees. The use of swarm traps to reduce the Africanized honey bee problem was proposed. The Carl Hayden Bee Institute was consulted. The use of swarm traps will only help reduce the numbers of bees that are migrating (i.e. moving to a new hive), and not

significantly reduce established hives. Until the hive is ready to divide, the bees won't move away from their queen. This option by itself was rejected, however, it is proposed for use in conjunction with other treatments to form an integrated approach to pest management.

Mechanical Methods for Rodents in Dwellings. This alternative would allow only the use of exclusionary devices and live traps for rodents causing damage in the cliff dwellings. This method alone has been tried and it was determined that it is not effective for some rodents that avoid traps. There is documentation of rodents burrowing under the traps to try to get to the bait and causing more damage to the cultural resources. The use of exclusionary devices and traps are the preferred method of treatment, however, chemical pesticides would be considered for use when other methods are not effective.

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. Employees accessing the cliff dwellings are equipped with bee hoods, emergency equipment staged in the dwellings, and appropriate safety training. All employees are familiar with the Africanized Honey Bee Safety Plan.

- **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 Mexican Spotted Owl and the Bald Eagle have been recorded at TNM, although they are not known to spend measurable time in the monument and are not known to nest there. 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. When pesticides are applied by rappelling down the cliff faces, all personnel involved in rappelling will be certified by the American Mountain Guides Association (AMGA) and be equipped with all necessary safety equipment.

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.

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 1: No Action – Continue with Current Management Program

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

Africanized honey bees is the integrated use of mechanical and chemical treatments. Chemical treatments are sometimes needed for problem rodents in the prehistoric cliff dwellings.

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, lack of visitor enjoyment due to trail closures, and risks to both visitor and staff health and safety due to active and dangerous Africanized bee infestations. 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 2: Preferred Alternative – Full use of Integrated Pest Management techniques (mechanical, cultural, chemical, and biological control) to manage pest species.

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 TNM 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 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 2 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 planning for the prevention and proactive treatment of pest populations. Pest populations (including such species as Africanized honey bees, 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 2: Integrated Pest Management Plan Objectives

Plan Objective	Alternative 1: No Action – Continue with Current Management Program	Alternative 2: Preferred Alternative – Full use of Integrated Pest Management techniques (mechanical, cultural, chemical, and biological control) to manage pest species.
Treat pests that pose a threat to human health and safety, and to natural and cultural resources.	While park management always strives to ensure human health and safety, this alternative results in the greatest risks due to the continued presence of large hives of Africanized honey bees in the vicinity of visitor use areas.	The proactive and frequent treatment of Africanized honey bee hives reduces the risk to human health and safety, more than Alternative 1.
Maintain access to monument resources for visitors and staff.	Currently, the primary park resources – the cliff dwellings – are frequently closed to visitor and staff due to risks associated with large, active hives of Africanized honey bees. Bees would only be treated under emergency situations; therefore, it is likely that frequent closures of the dwellings and diminished visitor satisfaction would continue.	The proactive and frequent treatment of Africanized honey bees to reduce bee populations over the long-term would result in fewer closures of the dwellings and a more rewarding and positive experience for visitors.
Prevent infestations of pest species when possible.	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, rather than treating them after they are identified.

Table 3: Environmental Impact Summary by Alternative

Impact Topic	Alternative 1: No Action – Continue with Current Management Program	Alternative 2: Preferred Alternative – Preferred Alternative – Full use of Integrated Pest Management techniques (mechanical, cultural, chemical, and biological control) to manage pest species.
Human Health and Safety	Potential threats to human health and safety from Africanized honey bees are greatest under this alternative. Impacts are predicted to be moderate, adverse and direct in the short and long-term as Africanized honey bee populations would not be treated on a regular basis, posing the risk of stings and/or attacks to visitor and staff in the vicinity of the hives.	This alternative would result in minor, adverse, direct in the short and long-term impacts as it is not possible to completely eradicate all potential threats from bees. Bee hives would be regularly monitored and treatments (including pesticides) could be applied on a regular basis.
Visitor Use and Experience	This alternative would result in the greatest adverse impact to visitor use and experience. Impacts to visitor use and experience would be moderate, adverse, and direct in the short and long-term. The cliff dwellings would continue to be closed to visitors on a regular basis.	Impacts to visitor use and experience would be minor, adverse, and direct in the short and long-term. Depending on bee activity in the vicinity of the monument, staff may still need to close the dwellings to visitors, thus negatively impacting their experience. It is predicted that closures would be much less frequent under this alternative.
Park Operations	There would be a moderate, adverse and direct impact on park operations in the short and long-term from Alternative 1 because the IPM program would be reactive, rather than proactive. Staff would continue to react to problems, rather than building a program that prevents pest issues.	Impacts to park operations would be minor, adverse and direct as staff implements preventative measures and frequent bee treatments to reduce hive activity in the short-term. In the long-term, impacts would be beneficial and moderate as less staff time would be spent on routine pest prevention treatments.

Impact Topic	Alternative 1: No Action – Continue with Current Management Program	Alternative 2: Preferred Alternative – Preferred Alternative – Full use of Integrated Pest Management techniques (mechanical, cultural, chemical, and biological control) to manage pest species.
Archeological Resources	There would be a moderate, adverse, direct, short and long term impacts to the original fabric of the cultural resources from Alternative 1 because the potential for damage to archeological resources is increased due to bioturbation and disturbance from frequent mechanical treatments.	Removal of pests using the full range of tools would have less impacts to archeological resources than alternative 1. Because small mammals would continue to be an issue in the cliff dwellings, the impacts would be minor and adverse in the short and long term.
Wildlife	The impacts of implementing this alternative would be minor, adverse and direct in the short and long term from the treatment of invasive pest species, primarily those inside park buildings and cliff dwellings.	The impacts of implementing this alternative would be minor, adverse and direct in the short and long term from the treatment of invasive pest species, primarily those inside park buildings and cliff dwellings. Should additional pest species become established in the future, the level of impact could reach moderate under the 'worst case' scenario.

ENVIRONMENTAL CONSEQUENCES

This chapter analyzes the potential environmental consequences, or impacts, that would occur as a result of implementing the No Action (Alternative 1) and Preferred Alternative (Alternative 2). Topics analyzed in this chapter include human health and safety, visitor use and experience, park operations, archeological resources, and wildlife. Direct, indirect, and cumulative effects are analyzed for each resource topic that has been carried forward. Potential impacts are described in terms of type, context, duration, and intensity. Specific impact thresholds are given for each resource at the beginning of each resource section. General definitions are defined as follows:

- **Type** describes the classification of the impact as either beneficial or adverse, direct or indirect:
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** describes the area or location in which the impact will occur. This answers the question: Are the effects site-specific, local, regional, or even broader?
- **Duration** describes the length of time an effect will occur, either short-term or long-term:
Short-term impacts generally last only during treatment, and the resources resume their pre-treatment conditions after completion of the project.
Long-term 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 fabric can be physically repaired, that loss or damage constitutes a permanent impairment of a nonrenewable resource.
- **Intensity** 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/Assessment of Effect.

Cumulative Effects:

The Council on Environmental Quality (CEQ) regulations, which guide the implementation 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 No Action and Preferred Alternatives.

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 monuments and, if

applicable, in the surrounding region. The geographic scope for this analysis includes elements within the Monuments' boundaries and areas adjacent to the monuments. The temporal scope includes projects within a range of approximately ten years. Given this, the following projects, listed from past to future, have been identified for the purpose of conducting this cumulative effects analysis:

Monument Construction: Construction projects create disturbance that could, without proper precautions, enhance pest species habitat. Precautions are taken to ensure that construction materials are properly stored. Building construction plans call for a number of pest prevention measures such as sealing cracks, caulking and other practices.

Africanized Honey Bees: Africanized honey bees continue to spread and continue to interbreed with European honey bees. All hives that have been tested at TNM contain a mixture of both strains. It is expected that bees at TNM and in the general area of the monument will continue to interbreed and result in increased risks to human health and safety from more aggressive bee colonies and more frequent swarm attacks.

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

In this Environmental Assessment/Assessment of Effect, 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/Assessment of Effect 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. Any action taken under this project which does not meet the appropriate undertakings eligible for Streamlined Review in the National Park Service Programmatic Agreement (2008) or has the potential to adversely affect either archeological or historic sites on or eligible for the National Register will be subject to individual and separate §106 compliance.

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*).

Human Health and Safety

Affected Environment

Human health and safety of both park visitors and staff are at risk due to large populations of Africanized honey bees in the vicinity of the cliff dwellings, park administrative buildings, the picnic area, and on trails. It is assumed that all hives at TNM are at least partially Africanized, meaning that the bees may display aggressive behavior. The behavior starts as pelting (physically bumping) a perceived threat (including humans) and may escalate to stinging should the perceived threat persist. The natural reaction to wave your arms to keep the bees away only serves to increase the level of perceived threat to the bees and cause them to increase their reactions. When bees sting they release a pheromone that incites other bees to sting, thus exponentially increasing the risk.

Many humans are highly sensitive to stings from bees and other invertebrates. Even one sting can cause anaphylactic shock which is an allergic response that can result in sickness and death to people with this sensitivity. Additional risks are posed by Africanized honey bees because they sometimes swarm their 'victims'; the body is covered in bees and receives multiple stings. There have not been any multiple sting events documented at the monument,

however, many urban areas in Arizona have reported swarming and multiple stings. High Country News (March 24, 2009) reported Africanized honey bees were responsible for four deaths in Arizona, and as many as eight additional deaths in NM, CA and TX. About.com (7/12/10) reports five deaths in AZ. Several news articles on the internet describe multiple incidents of swarms of bees attacking humans resulting in hundreds of stings and hospitalization of the victims. The focal resources of the park – cliff dwellings- have been closed approximately 20% of the time over the last 2 years because of high levels of Africanized bee activity, in order to protect human health and safety.

Pest species indoors such as mice and insects are also treated at the monument to protect human health and safety. Mice carry Hanta Virus which causes respiratory problems in humans and sometimes death. Internet sources report an average of one death per year due to Hanta Virus in Arizona.

Methodology and Intensity Thresholds

Africanized honey bees are the most serious pest species currently in the monument because of the risk they pose to human health and safety. Because of ongoing issues between bees and humans, the park has developed a modified Severity Probability Exposure (SPE) model (Appendix B).

This model looks at factors influencing bee behavior and determines a level of risk. Factors considered are: number of bees/hive/minute, number of visitors, temperature, number of active hives, wind speed, and bee behavior. Park staff use the results of the risk assessment along with their common sense and experience to determine if the dwellings should be open or closed. The SPE model is used here to help determine impact intensity. No adverse impacts to human health and safety from the application of pesticides are expected to occur. All pesticides will be applied by licensed applicators according to label directions. Duration of impacts to human health and safety would be considered short-term if the impacts last less than three years.

Table 4: Impact Intensities and Definitions – Human Health and Safety

Impact Intensity	Intensity Definition
Negligible	The potential risk to human health and safety would be slight or non-existent. There may be occupied hives in the vicinity of visitor use areas, however few active bees would be present. The SPE model would indicate that factors used to determine the level of risk are low: number of bees, visitors, and active hives; temperature, wind speed and behavior of bees. The chance of a person being exposed to Hanta Virus or stung by a bee or by an indoor pest species would be very low.
Minor	The potential risk to human health and safety would be relatively small. There may be occupied hives and active bees in the vicinity of visitor use areas, however, the results of the SPE indicates a low risk and staff should consider keeping the areas open. The chance of a person being exposed to Hanta Virus or stung by a bee or by an indoor pest species would be very low.

Impact Intensity	Intensity Definition
Moderate	The potential risk to human health and safety would be intermediate. There may be occupied hives in the vicinity of visitor use areas. The SPE results would be intermediate, indicating the presence of active bees and other risk factors, but not indicating that the dwellings should be closed. There is a moderate risk that a person could be stung. The chance of a person being stung by an invertebrate species or exposed to Hanta Virus is low.
Major	The risks posed to human health and safety would be substantial. The SPE would indicate a number of factors (number of bees, temperature, wind, number of visitors, etc.) and indicate the area should be closed. There is a high risk to human health and safety. The chance of a person being stung by an invertebrate species or exposed to Hanta Virus is low.

Discussion of Alternatives in relation to Human Health and Safety

Alternative 1: No Action – Continue with Current Management Program

Impacts: Risks to human health and safety would be moderate under this alternative, primarily due to the presence of active Africanized honey bee hives. The dwellings would continue to be frequently closed due to high levels of honey bee activity. Hives would only be treated when the SPE model indicates an emergency situation. It is possible that the daily risk assessment might not capture the actual level of bee activity. For example, if the assessment is done in the morning the hive may become more active later in the day as air temperatures increase. The SPE model errs on the side of caution, however, it is not possible to predict when the bees may become active, even when environmental conditions remain stable. As long as high numbers of bees are present in the vicinity of the dwellings, there is a moderate risk to human health and safety.

Visitors would be informed of the risks posed by Africanized honey bees so they can determine if they want to visit the dwellings and other areas of the monument where bees could be present. Park staff will advise all persons that could be sensitive to bee stings to not visit the dwellings. It is assumed that those with sensitivities to bee stings will opt not to visit the cliff dwellings.

Risks posed from indoor small mammals would be minor as snap traps would be deployed in any building where rodent infestations are suspected. There is an increased risk from indoor invertebrates as no chemical spraying would be done unless there is an identified threat.

There are no known threats to human health and safety from the application of chemical pesticides. All pesticides would be applied strictly according to label directions, using appropriate application tools and safety gear. The cliff dwellings and park buildings would be closed during pesticide applications.

Cumulative Impacts. The cumulative impacts to human health and safety from this alternative would be negligible. The few number of hives that are being treated would not impact bee populations in the area. This alternative would not result in additional ground disturbance that would increase habitat for pest species.

Conclusion. The risks posed to human health and safety from Alternative 1 are moderate in the short and long-term, direct and adverse, primarily from the presence of Africanized honey bees in areas of visitor and staff use. The cumulative effects are negligible.

Alternative 2: Preferred Alternative – Full use of Integrated Pest Management techniques (mechanical, cultural, chemical, and biological control) to manage pest species.

Impacts: The primary difference between this alternative and Alternative 1 in relation to human health and safety is that Africanized honey bee hives would be routinely treated with pesticides to prevent the build-up of bee populations. Regular treatments would substantially reduce the numbers of bees and thus reduce the risk to human health and safety. The SPE model would be done at least once a day and staff would continue to err on the side of caution when determining if the dwellings should be closed to visitation. Although this alternative proposes to treat all hives in the vicinity of the cliff dwellings, no treatment is proposed for hives that do not pose an imminent threat to human health and safety. This means that Africanized honey bees will continue to be present in the monument and continue to pose a threat to humans; a threat present in all wildland settings.

Although the risks to human health and safety are currently minimal from indoors pests, these risks would further be reduced. Routine pest inspections, more proactive prevention measures (exclusion, sanitation, etc.), and spraying of pesticides in buildings could prevent infestations before they reach emergency levels.

Visitors would still be informed of the risks posed by Africanized honey bees so they can determine if they want to visit the dwellings and other areas of the monument where bees could be present. Park staff will advise any people with sensitive to bee stings not to visit the dwellings.

It is not possible to predict Africanized honey bee behavior so there would always be the potential for minor, adverse, direct impacts to human health and safety due to the presence of the Africanized honey bees within the monument. However, because all visitors would be advised of this risk, it is assumed that those with sensitivities would opt not to visit the dwellings.

There are no known threats to human health and safety from the application of chemical pesticides. All pesticides would be applied strictly according to label directions, using appropriate application tools and safety gear. The cliff dwellings and park buildings would be closed during pesticide applications.

Cumulative Impacts. Cumulative effects are similar to Alternative 1.

Conclusion. The risks to human health and safety would be reduced by routine treatments of Africanized honey bee hives in the vicinity of cliff dwellings and park administrative buildings, there would be increased prevention of indoor pests, and pesticides may be applied more readily than under Alternative 1. The impacts of this alternative would be minor, adverse and direct in the short and long-term. Preventative measures and bee treatments would be implemented, but it is not possible to prevent 100% of insect stings in wildland settings. Cumulative effects are similar to Alternative 1.

Visitor Use and Experience

Affected Environment

The Upper and Lower Cliff Dwellings are the primary resources and focal point of the monument. On average, 60,000 people visit the monument each year to experience the Salado culture. TNM is one of the few places to allow visitors inside the cliff dwellings to experience prehistoric lifeways. At TNM visitors experience how the Salado people lived. They can look out over the landscape and see some of the same scenes that people looked at hundreds of years ago.

There are a number of pest species that impact visitor use and experience. There are 'infrequent' pest species such as rattlesnakes that startle visitors and are moved to the backcountry by park staff. The biggest impact to the visitors and park operations are the large Africanized honey bee hives in the vicinity of the cliff dwellings. When the hives are active they pose a serious risk to human health and safety. In order to minimize this risk, the cliff dwellings are frequently closed to visitors and staff, thus impacting the visitor experience. Visitors drive considerable distances to visit the monument. Many come from Phoenix which is over 100 miles away, or 140 miles from Tucson. For many international visitors this is a once in a lifetime opportunity to experience the cliff dwellings. The Lower Cliff Dwelling trail was closed 11 days in 2008 and 7 days in 2009. In addition to these closures there were many days when visitors were allowed on the Lower Cliff Dwelling trail to view the dwelling, but were not allowed to access the dwelling. It is estimated that access to the Lower Cliff Dwelling was closed to visitors 20% of the time due to bee activity. When the trail is open and the dwelling is closed, visitors are allowed to walk up to a viewpoint a safe distance from the active hives. While this allows visitors the opportunity to view the dwelling, the trail is narrow and only allows a good vista for two to three people at one time. If more visitors are present, there are safety issues with this many people safely moving about the area.

Many visitors express disappointment that they are not able to have the opportunity to access the dwellings. Repeat visitors express the highest level of disappointment as they know what a rewarding experience it is to be inside the dwellings. First time visitors express less disappointment as they are not as aware of what they are missing. While visitors express disappointment, most understand the situation. Unfortunately, many visitors leave the monument not understanding the interpretive story of the Salado culture that once occupied this site.

Methodology and Intensity Thresholds

Analyses of the potential intensity of impacts to visitors were derived from the available park visitation records, visitor comments, and park records on the closure of the cliff dwellings. Duration of impacts to visitor use and experience would be considered short-term if the impacts last less than three years. The thresholds of change for the intensity of an impact are defined as follows:

Table 5: Impact Intensities and Definitions – Visitor Use and Experience

Impact Intensity	Intensity Definition
Negligible	The effect on availability of desired visitor experiences, or the number of visitors affected, would be slight or non-existent.

Impact Intensity	Intensity Definition
Minor	The effect on availability of desired visitor experiences, or the number of visitors affected, would be relatively small. The effect would be limited to relatively few individuals, be localized in area or short in duration, and/or affect visitation to the primary park resources (i.e. cliff dwellings).
Moderate	The effect of availability of desired visitor experiences, or the number of visitors affected, would be intermediate. The effect would involve an intermediate number of visitors, portion of the park, duration, and/or affect visitation to the primary park resources.
Major	The effect of availability of desired visitor experiences, or the number of visitors affected, would be substantial. The effect would involve a substantial number of visitors, duration, and/or affect recreation opportunities to the primary park resources. The visitor would likely be able to express a strong opinion about the impacts.

Discussion of Alternatives in relation to Visitor Use and Experience

Alternative 1: No Action – Continue with Current Management Program

Impacts: Closure of the park's primary resources (the cliff dwellings) due to active Africanized honey bees hives result in visitor frustration and disappointment. Impacts to visitor use and experience from other pest species are negligible. Under this alternative, the Lower Cliff Dwelling would be closed about 20% of the year and both the trail and the dwelling would be closed for approximately 7-11 days per year due to risks from active hives and populations of Africanized honey bees. Visitors would be disappointed and frustrated as they would not be allowed inside the ruins and be immersed in the actual setting of the Salado culture. Impacts to visitor use and experience would be moderate, adverse, and direct in the short and long-term.

Cumulative Impacts: The cumulative impacts to visitor use and experience from this alternative would be negligible. No construction projects are planned that would increase the pest problem to where it would impact the visitor experience. The predicted increase in Africanized honey bees in the vicinity of the monument is not expected to result in a measurable impact to visitor use and experience. Cumulative impacts from this alternative are negligible.

Conclusion: Impacts to visitor use and experience would be moderate, adverse, and direct in the short and long-term. Cumulative impacts would be negligible.

Alternative 2: Preferred Alternative – Full use of Integrated Pest Management techniques (mechanical, cultural, chemical, and biological control) to manage pest species.

Impacts. Under Alternative 2, proactive bee treatments would be conducted on a routine basis to ensure Africanized honey bee populations are kept at low levels in order to keep the cliff dwellings open to visitors and staff. Because bee behavior is not possible to predict (and behavior changes based on a number of factors including climate variables) there may still be days when the SPE assessment results in closures.

It is not possible to quantify the number of days that closures may be enforced, however, it is predicted that it would be substantially lower than current levels. Because there may still be

closures, the impacts to visitor use and experience would be minor, adverse, direct in the short and long-term.

Cumulative Impacts. Cumulative effects are similar to Alternative 1.

Conclusion: Impacts to visitor use and experience from full use of integrated pest management treatments would be minor, adverse, and direct in the short and long-term. Cumulative effects would be negligible.

Park Operations

Affected Environment

“Park operations” refers to day to day management and operations. Pest problems are causing impacts to park operations. Due to the Africanized honey bee hives, the cliff dwellings are often closed to visitors and staff. The Lower Cliff Dwelling has been closed approximately 20% of the time for the last two years. The trail to view the ruins has been closed 7-11 days each year. The impacts to park operations from the closures are somewhat similar to those described for visitor use and experience; closures also result in a level of frustration for staff members. The interpretive staff is not able to conduct interpretive tours for the visitors. Archeologists are not able to conduct ruins preservation treatments. Biologists focus their time and effort on pest management, at the expense of other resource management issues. Under Alternative 1, park operations would continue to respond to pest problems on an as-needed basis only after risks to human health and safety and/or damage to park facilities has been identified. At this time there is no detectable impact to park revenue.

Methodology and Intensity Thresholds

Analyses of the potential intensity of impacts to park operations were derived from park staff and, and park records on the closure of the cliff dwellings. Duration of impacts to park operations would be considered short-term if the impacts last less than three years. The thresholds of change for the intensity of an impact are defined as follows:

Table 6: Impact Intensities and Definitions – Park Operations

Impact Intensity	Intensity Definition
Negligible	Park operations would not be affected or the effect would be at or below the lower levels of detection, and therefore would not have an appreciable effect on park operations.
Minor	The effect would be detectable, but would be of a magnitude that would not have an appreciable adverse or beneficial effect on park operations. If mitigation were needed to offset adverse effects, it would be relatively simple and successful.
Moderate	The effects would be readily apparent and would result in a substantial adverse or beneficial change in park operations in a manner noticeable to staff and the public. Mitigation measures would probably be necessary to offset adverse effects and would likely be successful.

Impact Intensity	Intensity Definition
Major	The effects would be readily apparent and would result in a substantial adverse or beneficial change in park operations in a manner noticeable to staff and the public, and be markedly different from existing operations. Mitigation measures to offset adverse effects would be needed, could be expensive, and their success could not be guaranteed.

Discussion of Alternatives in relation to Park Operations

Alternative 1: No Action – Continue with Current Management Program

Impacts: A continuation of current management practices related to pest management would result in a moderate, adverse, and direct impact to park operations in the short and long term. Park staff would continue to be frustrated by the inability to conduct interpretive tours, archeological preservation treatments, and routine maintenance in the cliff dwellings. Park staff would continue to react to pest issues only after severe problems have been identified; they would work to fix the problem(s) rather than being able to prevent them. In the long-term it is expected that more staff time would be spent mitigating the damage from pest problems under this alternative.

Cumulative Impacts: The cumulative impacts from this alternative would be negligible as construction projects and increased Africanized honey bee populations in the future would not have a measurable effect on park operations.

Conclusion: There would be a moderate, adverse and direct impact on park operations in the short and long-term from Alternative 1 because the IPM program would be reactive, rather than proactive. Cumulative impacts would be negligible.

Alternative 2: Preferred Alternative – Full use of Integrated Pest Management techniques (mechanical, cultural, chemical, and biological control) to manage pest species.

Impacts: Impacts to park operations would be reduced under full use of integrated pest management. It is predicted that the cliff dwellings would be open more often under this alternative, allowing staff to conduct their regular duties. Staff would conduct routine monitoring and inspections of park facilities to ensure cultural treatment measures are in place (such as: sanitation, exclusion, and removal of clutter and habitat sources) to prevent pest species. Preventative measures would result in reduced staff time spent on IPM issues. There may be a short-term increase in time spent on pest management issues for resource staff implementing initial bee treatments until the hives are significantly reduced and the treatments are applied on a less frequent basis. There may also be an initial increase in maintenance staff time to conduct inspections and install preventative measures. Overall impacts are predicted to be minor, adverse and direct as staff time is focused on facilities inspections, implementing preventative treatments, and on frequent hive treatments. In the long-term the impacts would be moderate, beneficial, and direct as less staff time is spent on routine pest management tasks.

Cumulative Impacts: Similar to Alternative 1.

Conclusion: Impacts to park operations would be minor, adverse and direct as staff implements preventative measures and frequent bee treatments to reduce hive activity in the

short-term. In the long-term impacts would be beneficial and moderate as less staff time is spent on routine pest prevention treatments. Cumulative effects would be negligible. Park operations would not be impaired by the adoption of this alternative.

Archeological Resources

Affected Environment

Tonto National Monument contains cultural resources including pueblo ruins, cliff dwellings, lithic scatters, fieldhouses, isolated architectural features, historic ranching features and campsites. The monument's cultural resources represent approximately 10,000 years of human occupation. The monument was intensively (100%) surveyed in 1985 by Martyn Tagg. There are 68 recorded archeological sites within the monument boundary listed in the ASMIS database. The primary resources of concern related to IPM are the cliff dwellings. The Upper Cliff Dwelling (TONT00050) consists of a 32 room masonry/adobe structure with significant elements including partially intact roof areas in Rooms 4, 21, and 27, numerous wood elements preserved in the walls, and the Park's only plasterglyph. The Lower Cliff Dwelling (TONT 85A-51) consists of a 16 room masonry/adobe structure which includes a fully intact roof in Room 14 and numerous wood elements. The cliff dwellings primarily represent a Late Classic Period, Gila Phase occupation dating ca.1300 – 1450 AD. All cultural resource sites are susceptible to burrowing by rodents which cause damage to intact original fabric. Known cultural resource sites are periodically monitored for signs of impacts, including rodent burrows.

Small mammals are known to cause impacts to archeological sites, primarily from their burrowing activities in the two cliff dwellings. Carpenter bees sometimes infest the wooden beams in the cliff dwellings. Africanized honey bees are present in the vicinity of the dwellings, but impacts to archeological resources from the bees have not been detected.

Methodology and Intensity Thresholds

Analyses of the potential intensity of impacts to archeological resources were derived from the available scientific data and literature as well as monument staff's past observations of the effects on archeological resources during past stabilization and mitigation projects. Duration of all archeological resource impacts is considered long term (permanent) because, even if the physical damage can be repaired, damage to an archeological site cannot be adequately mitigated. The thresholds of change for the intensity of an impact are defined as follows:

Table 7: Impact Intensities and Definitions – Archeological Resources

Impact Intensity	Intensity Definition
Negligible	Impact is at the lowest levels of detection, barely perceptible and not measurable.
Minor	The impact on archeological sites is measurable or perceptible, but it is slight and localized within a relatively small area of a site or group of sites. The impact does not affect the character defining features of a National Register of Historic Places eligible or listed archeological site and would not have a permanent effect on the integrity of any archeological site.
Moderate	The impact is measurable and perceptible. The impact changes one or more character defining feature(s) of an archeological resource but does not diminish the integrity of the resource to the extent that its National Register

	eligibility is jeopardized.
Major	The impact on archeological sites is substantial, noticeable, and permanent. The impact is severe or of exceptional benefit. For National Register eligible or listed archeological sites, the impact changes one or more character defining features(s) of an archeological resource, diminishing the integrity of the resource to the extent that it is no longer eligible for listing in the National Register

Discussion of Alternatives in relation to Archeological Resources

Alternative I: No Action – Continue with Current Management Program.

Impacts: Adverse impacts to archeological resources are expected to be greatest under this alternative, primarily from rodents burrowing into the original materials of the structures. This is an issue at both of the cliff dwellings, and at all known archeological sites. Mechanical methods (live trapping) would be the primary treatment used when rodent species have been detected in the cliff dwellings. This method is effective for most animals; however, individuals may avoid the traps. These individuals cause additional resource damage from burrowing in and under the traps trying to get at the bait. Impacts from small mammals can have the potential to have moderate, adverse, direct, short and long term impacts to the original fabric of the cultural resources. Chemical treatments, such as the use of zinc phosphide, are not allowed under this alternative.

Carpenter bees and other wood boring insects are treated with cultural methods using exclusion by filling their burrows with unamended mortar or cork plugs. Sometimes the carpenter bees are treated using boric acid, a low impact chemical treatment. The impacts from carpenter bees and treatments have been minimal. No food or drinks are allowed in the dwellings as a pest prevention measure.

When pesticide applicators are rappelling above the cliff dwellings their rope line is restricted to outside the drip line of the cliff dwellings in order prevent rock fall from impacting prehistoric fabric. Hives are on the cliff faces adjacent to the dwellings but are not located within the architecture of the sites. The impacts from bee hives and treatments are negligible.

Cumulative Impacts: The administrative building construction project and increasing Africanized honey bee populations are not expected to have any cumulative effects on archeological resources.

Conclusion: Impacts to archeological resources from this alternative would be moderate, adverse, direct, short and long term impacts, primarily from small mammals that are not effectively treated using live traps. Cumulative effects would be negligible. There would be no impairment from the implementation of this alternative.

Alternative II: Preferred Alternative – Full use of Integrated Pest Management techniques (mechanical, cultural, chemical, and biological control) to manage pest species.

Impacts: Adverse impacts to archeological resources are expected to be lowest under this alternative, because small mammals would be treated most effectively. Monument staff monitor disturbances in the cliff dwellings on a daily basis by looking for signs of burrowing and other

disturbances. Wildlife cameras are installed at key locations in the dwellings to detect the presence of pest species. There is no treatment method available to prevent small mammals in the ruins so some level of bioturbation occurs prior to our ability to treat pests. Chemical pesticides such as zinc phosphide would be permissible if live trapping is ineffective for small mammal pests in the cliff dwellings. Using the most effective treatment in a timely manner would reduce the adverse impacts to cultural resources, compared to Alternative 1. Because small mammal pests would continue to be an issue in the cliff dwellings, the impacts from this alternative (even in the worst-case-scenario) would be minor, adverse, and direct in the short and long term.

Impacts related to Africanized honey bees, carpenter bees and other invertebrate species would be similar to Alternative 1, and are negligible.

Cumulative Impacts: These impacts are similar to Alternative 1.

Conclusion: Impacts to archeological resources from this alternative would be minor, adverse and direct in the long-term; impacts would result from small mammal burrowing. Cumulative effects would be negligible.

§106 Summary: Tonto National Monument contains numerous archeological sites, many of which do not retain standing architecture or are self-stabilized. All of these sites are included as contributing sites on the National Register of Historic Places nomination and are covered by the provisions of §106 of the National Historic Preservation Act. Any action taken under this project which does not meet the appropriate undertakings eligible for Streamlined Review in the National Park Service Programmatic Agreement (2008) or has the potential to adversely affect either archeological or historic sites on or eligible for the National Register will be subject to individual and separate §106 compliance.

Wildlife

Affected Environment

TNM supports a variety of wildlife species, 129 vertebrate species have been recorded (Albrecht et al 2007). There were 21 amphibian and reptile species recorded; the most common were the common side-blotched lizard, ornate tree lizard and western whiptail. A total of 97 bird species have been recorded; some of the most commonly recorded species are the mourning dove, verdin, Bell's vireo, and northern cardinal. There were 11 mammal species reported and the most common are rodents: Bailey's pocket mouse and the cactus mouse. Larger mammals including collared peccary, mule deer, white tail deer, and ringtails have also been documented. There is little inventory data available for invertebrate species, most park records regarding invertebrates are related to pest species. It is known that there are large hives of Africanized honey bees in the crevices around the cliff dwellings. Ants, wasps, and termites are species that have been noted in park records as pests. Rock squirrels and other small mammals burrowing in the original fabric of the cliff dwellings have also been identified as a pest problem.

Methodology and Intensity Thresholds

Analyses of the potential intensity of impacts to wildlife were derived from available wildlife information, field observations, and monument staff's past observations of the effects of past IPM treatments on wildlife populations. Duration of impacts to wildlife would be considered

short-term if the impacts last less than three years. The thresholds of change for the intensity of an impact are defined as follows:

Table 8: Impact Intensities and Definitions – Wildlife

Impact Intensity	Intensity Definition
Negligible	Any effect to wildlife would be at or below the level of detection, short-term, site specific, and so slight that they would not be of any measurable or perceptible consequence to the species' population.
Minor	Effects to wildlife would be detectable, although short-term, site-specific, small, and of little consequence to the species' population. Mitigation measures, if needed to offset adverse impacts, would be simple and successful.
Moderate	Effects to wildlife would be detectable, although short-term, site-specific, with consequences at the population level. Mitigation measures, if needed to offset adverse impacts, would be extensive and likely successful.
Major	Effects to wildlife would be obvious, long-term, local or regional, and would have substantial consequences to wildlife populations in the region. Extensive mitigation measures would be needed to offset any adverse impacts and their success would not be guaranteed.

Discussion of Alternatives in relation to Wildlife

Alternative 1: No Action – Continue with Current Management Program

Impacts: Under this alternative the park would continue to manage pest species using cultural and mechanical treatments. Pesticides would continue to be used only in emergency situations. This would mean that treatments of pests such as Africanized honey bees would continue on a limited basis – in response to emergency situations, rather than long-term prevention and population management. Other pests would be treated on an as-needed basis with the least harmful treatment method available.

Invertebrates: It is recognized that even though honey bees are not native to North America, they play an important role in the pollination of a number of plant species. Bees are treated only in the vicinity of cliff dwellings when populations reach the level of posing risks to human health and safety. Spraying of hives eliminates both European and Africanized strains of bees. There is the potential for treatment of non-target invertebrates when treating the Africanized hives. These impacts are limited as the all chemical spray is directed at the hives and is not broadcast sprayed. The chemicals proposed for use on bee hives have the potential to affect all invertebrate species. Pesticides are infrequently used indoors to eliminate invertebrate pest species such as ants, spiders and others. Because the treatments are done infrequently and limited to dwellings and park facilities, impacts to invertebrate species are minor. Invertebrates would also be impacted by the use of Terminix®, Amodro® and Wasp Freeze®. These products are only applied in and around buildings and not used in natural areas of the monument. While they kill target populations, there would not be widespread mortality of these species in the monument.

Small mammals: Small mammals (i.e. mice and rats) inside of buildings are targets for elimination using snap traps. Rock squirrels and other rodents that invade the cliff dwellings and cause impacts to the original fabric are occasionally eliminated. Snap traps are used

indoors and all small mammals found indoors are targets. Live traps are used in the cliff dwellings to catch rodents, therefore, no non-target species are treated. These impacts are considered minor as an average of four squirrels per year are trapped. Numerous mice and pack rats are trapped in park facilities and vehicles. No treatments are currently conducted outside of the cliff dwellings or park buildings. No other species are commonly treated under current management practices.

This alternative could result in more individuals being eliminated in the long-term because the most serious infestations, such as Africanized honey bees and termites, are not treated until they reach 'emergency' levels. It is predicted that if more emphasis was placed on prevention and more treatments were conducted while populations are small in number, fewer individuals would be eliminated. Under this alternative, populations could reach high levels and necessitate treatment of the whole population rather than preventing or treating when populations are low. While this would be considered a beneficial impact in the long-term, it is not possible to predict the level of impact with the data currently available.

Cumulative Impacts: The continued increase in Africanized honey bees across the country and the continued interbreeding of the Africanized and the European honey bees is resulting in more aggressive hives and more frequent swarm attacks. Treatment of select hives in TNM is not expected to contribute to overall declines in bee numbers in the area. Cumulative effects from this alternative would be negligible.

Conclusion: The impacts of implementing this alternative would be minor, adverse and direct in the short and long term from the treatment of invasive pest species, primarily those inside park buildings and cliff dwellings. These impacts are minor because in most cases only problem individuals or small populations would be treated. Cumulative impacts would be negligible in the context of increasing Africanized honey bee populations, and because of the small number of other pest species that would be treated.

Alternative 2: Preferred Alternative – Full use of Integrated Pest Management techniques (mechanical, cultural, chemical, and biological control) to manage pest species.

Impacts: Using an integrated, proactive approach to manage pest infestations would allow the monument to use the most effective, integrated treatments in a timely manner. Under this alternative there is an emphasis on prevention measures and proactive treatments to eliminate pests before populations reach large numbers and impact park resources, visitors and staff. This proactive approach benefits wildlife species as prevention measures would help keep wildlife species out of park facilities thus reducing their risk of elimination. If a competitive, non-native pest species were to invade the park, under this alternative it could be eliminated before providing serious competition with native species for habitat resources. While no data exists, it is predicted that this alternative could result in fewer individuals being treated.

Invertebrates: Impacts to invertebrates except honey bees, would be similar to Alternative 1. Under the preferred alternative there would be a greater emphasis on treatment of bee hives in the vicinity of the cliff dwellings and park facilities. Hives in these areas would be targeted for frequent treatments and possibly elimination in the long-term in order to reduce the risk to human health and safety. There would be a greater use of chemical treatment under this alternative including the use of pesticides, and pheromones in the swarm traps. With the greater use of chemicals there would be more bees eliminated, and a slightly greater risk to non-target invertebrates that could be in the area during treatment. These non-target losses are

minimized as all pesticides are sprayed directly on the active hives. Tempo® is a pesticide proposed to treat bee hives.

Small mammals: Cultural treatments (prevention) would be applied on a more proactive basis and should help reduce the number of small mammals (primarily rodents) inside park buildings. Snap traps would continue to be used in buildings to eliminate all small mammals, similar to Alternative 1. Cliff dwellings would continue to be monitored for signs of rock squirrels. Live traps, would be used as the first method of treatment. If unsuccessful, chemical treatments such as zinc phosphide would be used. The chemical treatments would primarily be applied inside the cliff dwellings, however, if problems with burrows are detected in other known cultural resource sites, these areas may also be treated. The zinc phosphide would be applied only to the entrance of active burrows known to be occupied by rodents and is known to be toxic only to rodent species, thus minimizing impacts to non-target species and people. As described under Alternative 2, Tempo® used to kill bees has a relatively low toxicity to vertebrate species. Because Tempo® or other pesticides would be sprayed directly on the active hives, small mammals would not ingest the pesticide.

Medium-sized mammals: There are no current problems nor do monument documents indicate problems in the past with medium sized mammals causing impacts to cultural resources and park facilities. Medium sized mammals would include: fox, rabbits, badgers, etc. If a medium sized mammal were to be determined to be causing unacceptable impacts to park resources in the future, park staff would go through the Decision Tool to determine if treatments are needed and decide on the treatment with the least impact. Cultural and mechanical methods would be considered as the primary treatment methods, if determined to be effective. Pesticides would be used if other methods are not effective, or if the damage being caused is so severe that immediate elimination is necessary.

Biological Treatments

There are no known biological pest control treatments that are effective on pest species currently found in the monument. If effective biological control treatments are developed for the Africanized honey bee, for example, they would be considered if the impacts to non-target wildlife species would be moderate or less. If a new pest species were to become established at TNM and there is an effective biological control, it would be considered for use if the effects to wildlife species are moderate or less. If the impacts or effects of proposed biological treatments fell outside of those described in this document, additional analysis would need to be conducted.

In most cases, it is expected that impacts to wildlife species in the short and long-term would be minor and adverse from the loss of individuals and small populations. However, small mammal populations are known to cycle with very low numbers in some years and very high litter sizes in other years and pose threats to monument resources. It is also possible that as time progresses hives become more 'Africanized', meaning more of the bees interbreed and more show the more aggressive Africanized traits. It is also possible that bee numbers in general could increase across the area as populations continue to recover from the mite infestation in early 2000 where numbers of bees declined to very low numbers.

In order to predict the worst-case scenario, the level of impacts may reach a moderate level if a pest population were to explode in the future (e.g. increased small mammal populations following a high precipitation year or a colony of rock squirrels settling in the cliff dwellings). In order to capture potential unforeseen cycles in population numbers, it is possible that impacts to wildlife populations could be moderate from integrated pest management treatments.

Cumulative Impacts: Cumulative impacts are similar to Alternative 1.

Conclusion: The impacts to wildlife species from full use of integrated pest management treatments is expected to be minor to moderate, and direct in the short and long-term. The impacts from current levels of infestation would be minor. Should pest populations increase, such as new Africanized honey bee hives or the introduction of new pest species, the impacts could reach a moderate level under the worst case scenario. Cumulative effects from the preferred alternative would be negligible.

CONSULTATION AND COORDINATION

External Scoping

External (public) scoping was conducted to inform various agencies and the public about the proposal to implement integrated pest management at Tonto National Monument, and to generate input on the preparation of this Environmental Assessment/Assessment of Effect.

External scoping was initiated with the distribution of a scoping letter to inform the public of the proposal to implement invasive plant management, and to generate input on the preparation of this Environmental Assessment/Assessment of Effect. The July 6, 2010 scoping letter from Tonto National Monument was mailed to 18 addresses. Addressees included: various federal and state agencies, affiliated Native American tribes, local governments, and local news agencies.

Information on the Environmental Assessment/Assessment of Effect was also posted on NPS Planning, Environment, and Public Comment website (PEPC) at <http://parkplanning.nps.gov/>. The public was given more than 30 days to comment on the project during both scoping periods. No comments were received from the mailings or the internet postings. Addressees included:

Federal Agencies

US Forest Service
US Fish and Wildlife Service

State Agencies

State Historic Preservation Office
Gila County Courthouse
Mayor in Council, Globe, AZ
Payson Town Hall
Boyce Thompson Southwestern Arboretum

Affiliated Native American Groups

Ak-Chin Indian Community
Fort McDowell Yavapai Tribal Council
Hopi Tribe
Salt River Pima-Maricopa Indian Community
Pueblo of Zuni
Tohono O'odham Nation
Yavapai-Apache Nation
Yavapai-Prescott Tribe
White Mountain Apache Tribe
Tonto Apache Tribe
San Carlos Tribe

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.

Internal Scoping

Internal scoping was conducted by an interdisciplinary team of professionals from Tonto National Monument on 6/2/2010. Additional consultation has been ongoing with staff from NPS Southern Arizona, Intermountain Region, and Washington. Interdisciplinary team meetings were held to discuss the purpose and need for the project; objectives; 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 treatment areas, and discussed the impact analyses associated with this assessment. The results of multiple meetings are documented in this Environmental Assessment/Assessment of Effect.

Other internal meetings involving the environmental assessment of the invasive plant management program include the following:

- March 1, 2010 – IDT initial scoping meeting with TNM; attending were Duane Hubbard, Susan Hughes, Jenny Shrum and Michele Girard
- June 2, 2010 – IDT meeting to discuss IPM issues and objectives; attending were Duane Hubbard, Jenny Shrum and Michele Girard
- July 15, 2010 – IDT meeting to draft EA: attending were Duane Hubbard, Gavin Gardner, Susan Hughes and Michele Girard

Environmental Assessment/Assessment of Effect Review and List of Recipients

The Environmental Assessment/Assessment of Effect will be released for public review on 12/6/2010. To inform the public of the availability of the Environmental Assessment/Assessment of Effect, NPS will 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/Assessment of Effect will be provided to interested individuals upon request. Copies of the document will also be available for review at the Monuments' visitor centers and on the internet at www.nps.gov/tont.

The Environmental Assessment/Assessment of Effect is subject to a 30-day public comment period ending 1/10/2011. During this time the public is encouraged to post comments online at <http://parkplanning.nps.gov/tont> or mail comments to Superintendent; Tonto National Monument; HC02 Box 4602, Roosevelt, Arizona 85545. Following the close of the comment period, all public comments will be reviewed and analyzed prior to the release of a decision document. NPS will issue responses to substantive comments received during the public comment period, and will make appropriate changes to the Environmental Assessment/Assessment of Effect as needed.

List of Preparers

Preparers (developed EA content):

- Terry Saunders, Superintendent, NPS, Tonto National Monument, Roosevelt, AZ
- Michele Girard, Ecologist, NPS, SOAR, Phoenix, AZ
- Jenny Shrum, Biological Technician, NPS, Tonto National Monument, Roosevelt, AZ
- Duane Hubbard, Chief of Resources, Tonto National Monument, Roosevelt, AZ
- Roger Dorr, Archeologist on Detail, Tonto National Monument, Roosevelt, AZ
- Gavin Gardner, Archeologist, Tonto National Monument, Roosevelt, AZ
- Susan Hughes, Chief of Interpretation, Tonto National Monument, Roosevelt, AZ

Consultants (provided information):

- Myron Chase, IPM Coordinator, NPS Intermountain Region, Denver, CO
- Carol DiSalvo, IPM Coordinator, NPS Washington Office, Washington DC
- Staff of the Carl Hayden Bee Institute, Tempe, AZ
- William Currie, International Pest Management Institute, Ash Fork, AZ
- Don Swann, Biologist, Saguaro National Park, Tucson, AZ

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APPENDIX A: IMPAIRMENT

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

However, the laws do give the National Park Service the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the National Park Service the management discretion to allow certain impacts within park, that discretion is limited by the statutory requirement that the National Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible National Park Service manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of these resources or values. An impact to any park resource or value may, but does not necessarily, constitute an impairment, but an impact would be more likely to constitute an impairment when there is a major or severe adverse effect upon a resource or value whose conservation is:

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

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

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

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

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

Impairment findings are not necessary for visitor use and experience, socioeconomic, public health and safety, environmental justice, land use, and park operations, because impairment findings relates back to park resources and values, and these impact areas are not generally considered park resources or values according to the Organic Act, and cannot be impaired in the same way that an action can impair park resources and values. After dismissing the above topics, topics remaining to be evaluated for impairment include human health and safety, visitor use and experience, park operations, archeological resources, and wildlife.

Fundamental resources and values for Tonto National Monument are identified in the General Management Plan. According to that document, of the impact topics carried forward in this Environmental Assessment/Assessment of Effect, only archeological resources and wildlife are considered necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park; are key to the natural or cultural integrity of the park; and/or are identified as a goal in the park's General Management Plan or other relevant NPS planning document.

- **Archeological Resources** – Tonto National Monument was designated in 1907 to protect the extraordinary cliff dwellings, and associated human occupation of the area for nearly 10,000 years before present. Mobile groups of Archaic hunters and later groups that began seasonal farming and wildlife food gathering. Permanent occupation began around A.D. 600-700, and the cliff dwellings are thought to have been occupied from A.D. 1300 to 1450. The preferred alternative would be minor and adverse in the short and long-term as it is not possible to exclude small mammals from the cliff dwellings. Pest species causing impacts to archeological resources would be treated as soon as possible with the least impacting treatment method. Because these impacts are estimated to be minor, there would not be impairment to archeological resources from this proposal.
- **Wildlife** – Tonto National Monument provides habitat for a diversity of wildlife and invertebrate species. No species (native or non-native) would be eliminated under the preferred alternative, only identified pest populations or individuals would be treated. The impacts would be minor and adverse in the short and long term. However, most treatments would be limited to park facilities and the cliff dwellings. Because the impacts to wildlife species are predicted to be minor, and because no species would be eliminated from the monument, there would be no impairment to wildlife species.

In addition, mitigation measures for these resources would further lessen the degree of impact to and help promote the protection of these resources. Treatments would be applied only to identified pest individuals or populations, primarily in and around park facilities or in the cliff dwellings. The least harmful but effective pesticides would be used according to label directions. Park Service staff would monitor all treatment activities to minimize potential damage to archeological and wildlife resources.

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

APPENDIX B: MODIFIED SEVERITY PROBABILITY EXPOSURE (SPE) MODEL

Tonto National Monument				form last modified April, 2010			
Modified Severity Probability Exposure (SPE) Model							
Risk Assessment in areas with visitors and African Honey Bees-- should the dwelling be open to the public?							
Location: LCD/UCD							
Date:		Time:		Observer:			
Severity		Probability		Exposure			
# of bees/hive/min ¹		# of visitors ²		Temperature		# of active hives	Wind Speed
0-30		btwn 0-5		less than 50		btwn 0-2	windy!
1		1		1		1	-2
31-90	PLUS	btwn 6-15	PLUS	btwn 51-85	PLUS	btwn 3-4	moderate with strong gusts
2		2		2		2	-1
greater than 91		greater than 16		greater than 85		greater than 5	calm to moderate
3		3		3		3	0
TOTAL FROM ABOVE		behavior of bees		GRAND TOTAL			
		fo raging only				If the Grand Total is < 40	
		1				Consider Keeping the LCD/UCD	
		cur ious in cave				OPEN	
		5					
		iso lated sting				If the Grand Total is > 40	
		10				CLOSE the Dwelling	
		p elting					
		20					
1- the approximate number of bees going in and out of the MOST active hive in one minute							
2- the total number of visitors in the immediate vicinity -- (i.e. at the LCD, the number of visitors in the dwelling itself							
and along the last section of trail to where the cones are placed)							

APPENDIX C: AFRICANIZED HONEY BEE SAFETY PLAN

INTEGRATED PEST MANAGEMENT SAFETY PLAN AFRICANIZED HONEY BEES (*Apis mellifera scutella*) TONGO NATIONAL MONUMENT

May 2010

Species:

African Honey Bee (*Apis mellifera scutella*)

Purpose:

The purpose of this safety plan is to outline and implement a strategy for addressing safety concerns associated with Africanized Honey Bees (AHBs) at Tonto National Park. The ultimate goal of the plan is to prevent and protect Park visitors and employees from AHB bee stings and bee attacks while providing visitors access to the Monument's primary resource (the Lower Cliff Dwelling), and allowing staff to conduct their normal duties safely. The safety plan will establish a process for decision making, and define and delegate actions and responsibilities for the implementation of the plan.

The Problem at Tonto:

Honey bees build colonies in a variety of spaces including the voids in fractured rock. Numerous voids can be found in and near the Upper and Lower Cliff Dwellings. These dwellings represent the primary resource at Tonto, and are one of the last places where the public can walk into these impressive prehistoric structures. Increasing AHB activity has made it difficult for staff to provide a safe environment for the visitors who wish to enter the dwellings. This document will define the park's safety policy so that the staff can better assess risks and mitigate hazards associated with AHBs.

Background Information

AHBs have a tendency to display aggressive behavior that has earned them the somewhat dramatic title "killer bees." AHBs are a hybrid between non-native domesticated strains of the European Honey Bee (EHB) and an African strain accidentally released in Brazil in 1957, which has slowly migrated north. AHBs are very difficult to distinguish from their more docile European counterparts without genetic analysis or a series of careful measurements. AHBs were first detected in Arizona in 1993, and first confirmed in Tonto National Monument in 1997. Feral honey bee populations are becoming increasingly Africanized by hybridizing with the EHBs.

AHBs colonies reproduce, divide and swarm more frequently than EHBs; however AHB swarms and foraging bees are rarely dangerous. AHBs are also less selective in their nest locations, which may include hollows in trees and cacti, rock crevices, buildings (both abandoned and occupied), discarded tires, abandoned dens or holes in the ground, or even exposed areas like tree limbs and flower pots. In prime Sonoran Desert areas, there may be up to 20 to 40 EHB colonies per square mile and AHBs may have even greater colony densities. Typically bees forage between 50 to 130 meters from their colonies. Both strains need to be within 1 to 3 miles from a water source.

Aggressive behavior in AHBs is generally related to defense of an established colony. AHBs will attack perceived threats to the hive swiftly and intensely. They are more likely to mount a prolonged attack, sometimes following a victim up to a mile. Also, stinging or injured bees release a pheromone which stimulates other bees to attack. AHB stings are not different than

EHBs in the potency of their venom. A colony's aggressiveness will range from relatively docile to highly defensive, depending on environmental and genetic factors. A colony's behavior may change dramatically over a short period of time. Attacking AHBs can deliver 400 - 500 stings in a short time; the accumulated toxin from 500 stings can kill the average adult. Recent and credible statistics on the number of bee sting deaths per year are currently unavailable (cause of death is often cited under the complication that arose from the systemic response to envenomation rather than "bee sting").

Because AHBs are less selective in the locations of their nests, and due to their reliance on nearby water, all Park visitors and staff, especially those near facilities and nearby residential development (i.e., visitor centers, offices, and Park residences), are at risk of encountering AHBs. Staff whose routine duties include visiting either the Upper or Lower Cliff Dwellings are also likely to encounter bees in proximity to their hive. Anyone conducting work in the back-country must also be aware of the danger of discovering a hive. Activities which produce vibrations near a colony (from hiking to operating power tools or mechanized equipment) can cause AHBs to act defensively. Close proximity to a hive, dark colors, and aromatic chemicals may also trigger aggressive bee behavior. The persistence and tenacity of AHB attacks, their relatively recent arrival to Arizona, and the high percentage of out-of-state visitors unfamiliar with Arizona hazards make it critical that Park visitors and all employees are educated and aware. Park staff must be prepared to respond to AHB attacks and reports of bee colonies or activity.

Program Responsibility

Superintendent: Responsible for overall program management and oversight.

Chief of Visitor Services: Responsible for visitor protection issues concerning AHBs. Directs development and implementation of emergency response and reporting procedures. Ensures Ranger staff are trained to address all attack situations. Responsible for visitor education aspects of this plan. Develops safety messages, posts signs, and ensures that the public and staff are fully aware of the threat posed by AHBs and potential risks associated with visiting the ruins. Maintains safety equipment and conducts bi-annual assessments of equipment status. Insures that there is proper staffing available to

Chief of Resource Management: Responsible for resource management issues and research associated with AHBs. Directs maintenance of swarm traps, coordinates both contracted and in-park treatments, and develops and maintains a recording system for AHB activity. Monitors status of AHBs in Park and creates a yearly report on bee activity and treatment efficacy. Ensures the treatment processes and proposed chemicals meet the approval of the Regional IPM Coordinator. Conducts assessment of effects in areas where cultural resources could be impacted by bee treatments.

Regional IPM Coordinator: Oversees chemical use within the park and makes recommendations regarding treatment types, methods, and approved chemicals. Reviews the park's PUPS applications and year end reports.

Chief of Maintenance: Responsible for maintenance issues involved with AHBs related to structures and developed areas. Directs improvements to buildings to reduce bee colonization, and provides warning signs and barriers as needed. Seasonally clips back flowering bushes from trails to minimize contact between bees and visitors.

Safety Committee: Recommends to Superintendent and AHB Personnel (see below) the implementation of AHB Action Plan, including cooperation among divisions, assessment of emergency incidents and long-term programs, overseeing modifications to Plan, training, and designation and coordination of staff responders.

AHB Personnel: The Park will form an inter-divisional team of personnel for response to AHB activity in the Park. An inter-divisional team is important for a number of reasons: Park visitor and employee safety is the responsibility of *all* employees; an inter-divisional team will offer a more rapid response to AHB incidents; and since all employees run the risk of encountering AHBs, an inter-divisional team ensures education and experience with AHBs is well distributed throughout the Park staff. Individuals on the team should be screened for allergy to bee stings, be comfortable working with AHBs, and have protective clothing and equipment readily available. Park staff may volunteer to become team members, or individuals may be asked by the Safety Committee to work on the team.

Medical Specialist: This person is responsible for maintaining the condition and presence of bee incident response medical equipment at both the Upper and Lower Cliff Dwelling as well as the Visitor Center and Maintenance Area. This person will update medical contact information as needed and recommend training for staff.

All Staff: Currently, all staff monitor AHB activity and report bee activity to Resource and Interpretation staff. All staff should be trained to respond to AHB activity and attack, and have the necessary protective clothing and equipment for response readily available if attacked while on the job.

Injury Level

Injury caused by AHB's can result in two forms. AHBs threaten the safety of staff and visitors **directly** through their presence. The risk of being stung by an AHB reduces the quality of the visitor experience and work environment for staff. The perception of threat from AHB activity resulted in closing the LCD for approximately 75% of the summer season (further reducing visitor experience and staff's ability to conduct their duties). On average, there are about 2-3 stinging incidents every year. **Indirectly**, the AHB's negatively affect visitor and staff experience in several ways. The most significant effect is when the hive treatment process necessitates a dwelling closure thus denying visitors the ability to enter the dwellings. The integrity of the prehistoric setting is sometimes degraded by preventative measures such as crevice-sealing and prozap strips. Since no hives were present 700 years ago (honey bees are an introduced species) even the hives themselves are misrepresenting the prehistoric scene to the public. Honey bees have become so commonplace that even the staff is prone to forget that honey bees are not native and never plagued nor fed the Salado.

Action Level

Action is necessary if there is a credible threat to human life, property, or Park resources. The location of a colony and its threat to safety are the deciding factors when determining whether to eradicate a colony, or take a less dramatic course of action (avoidance or temporary closure). The greater the concentration of visitors and staff in an area, the greater the potential threat and the more urgent the required response. For this plan, the Park is divided into three zones:

Park Zones

Front-country: includes facilities (offices, residences, out-buildings, visitor center), parking areas, picnic area, the two Cliff Dwellings, and a 20 meter zone around these areas.

Mid-country: all trails.

Back-country: all other areas (inaccessible to visitors), away from trails and front country area.

Colonies will be assessed to determine their threat and what appropriate action should be taken. The following will be considered:

- apparent defensiveness and size of colony
- proximity to facilities, developments and human activities
- damage, injury or destruction of cultural and natural resources

Action Thresholds

It's the park's intention to set thresholds that will maximize visitor and staff safety.

In the *front country*, there will be a zero tolerance policy. All hives will be removed even in cases where no stinging events have occurred. Proactive measures such as wild flower trimming, crevice sealing, and swarm trapping (explained later) will be used to prevent a stinging event from ever occurring. Trail closures will be used as needed to maintain visitor and staff safety when hive treatment is not immediate, or in cases where a hive is inaccessible.

In the mid country, the action level will be set slightly higher (i.e. more tolerant). Hives will be removed only if proven problematic in the form of aggressive behavior, or due to close proximity to trails. *Some* preventative measures might be taken, such as trimming of wildflowers along the trail. Voids may be filled if in the ground, but rock voids will likely be left alone. One sting would necessitate the elimination of a hive, or the trail would be closed in the case of an inaccessible hive.

In the back country, the action level will be set much higher. Hives will not be eradicated unless extremely aggressive and in close proximity to prominent corridors used regularly by staff. Otherwise, the hive will be made known to all divisions and routes will be negotiated at safe distances around the hive. No preventative actions will be taken beyond notifying staff of hive locations.

Different Types of Actions Regarding AHB Management

AHB Monitoring

Tonto National Monument currently maintains two bee activity tracking logs. The first log utilizes a large scale photograph of the cliffs surrounding the dwellings. Each week, resource staff count the bees entering or exiting each hive per minute. This reveals the general activity of each hive (active or inactive) and tracks trends of each hive through time. Ultimately this log will help to demonstrate the efficacy of treatments as well. In the second log, Interpretation staff records overall bee activity at the Lower Cliff Dwelling throughout the course of the day in several hour blocks. This daily tracking documents any specific interactions between bees and visitors/staff and will reveal precursors to negative bee behavior (i.e. stinging) through time.

AHB Hive Eradication

Since established AHB colonies represent the only threat to visitor and staff safety, only these colonies will be targeted for eradication. Native bees and similar arthropods, because of their importance in the desert ecosystem, are not targeted for eradication. Similarly, actions taken against AHB colonies should not inadvertently affect these native insect populations.

If a hive is identified for removal because it has exceeded the threshold for the zone in which it was located, there are several methods of eradication available. Park staff will treat easily accessed hives with the use of products like diatomaceous earth, soapy water, Wasp Freeze®, and Prozap Strips® (no longer available for purchase, however existing stock can be utilized, Myron Chase pers. comm.). All chemicals will need to be approved for use through the Park IPM coordinator. Hives within the face of the cliffs surrounding the dwellings are typically inaccessible and will require the expertise of outside contractors (certified applicators). Other hives, depending on the degree of complexity, may also require the use of outside contractors. By far, the safest method of eradication is to allow professional bee handlers to remove AHB colonies. A list of approved AHB exterminators and their phone numbers is on file at Tonto National Monument. However, when AHB personnel need to remove colonies in certain cases, they will choose the most appropriate method of eradicating the colony as circumstances dictate.

Mechanical eradication can be used in certain circumstances. Colonies in the bee traps are generally wrapped in black plastic garbage bags to heat and starve AHB colonies. This method may also work on colonies with a restricted access to their hive (a hole or pipe, for example), and rags, caulk, plastic or expanding foam can be used to cover or fill in access holes.

Bee Swarm Trapping

Another form of treatment is swarm trapping which prevents the growth of bee problems by preventing new hives from forming in a specific area.

When a hive swarms, bees surround a new queen and push her out of the existing hive. Scout bees patrol the area for a suitable location for the new hive. The bee trap simulates (through pheromone and prime location) an ideal site and lures the colony into the false site. This colony is then easily treated and prevents the hive from establishing in an inaccessible or sensitive area.

This form of treatment will be conducted by a joint effort between park staff and an outside contractor (Northwest Exterminators). The exact details of this effort are on file at Tonto National Monument. This treatment is also a form of monitoring since the number of new hives trapped is a direct indicator of increased bee activity in the area.

Safety Closures

Interpretation staff and AHB personnel should be prepared to evacuate and secure an area to prevent visitor and staff injury until an AHB colony can be eradicated.

A Risk Assessment form, that is a modification of a SPE (Severity Probability Exposure) Model (see Appendix B above), will be used to determine whether the dwellings or other areas will remain open or closed at any given moment (bee activity can change frequently). This form is designed to help staff assess potential risk, and make apt decisions to insure that unnecessary risks are avoided. While visitor satisfaction is an important mission of the park, it cannot be valued above safety. Risk Assessments will be completed as soon as the staff arrive at the dwelling, and any time changes in bee activity are noted during the course of his or her shift.

The Risk Assessment has been approved by an interdivision team thereby relieving the responsibility of the one person making the decision in the field. If any staff decides the bee activity is serious enough to close the dwelling, it will remain closed until the situation has diffused and a new Assessment has been conducted that indicates safe conditions.

In The Event of an Attack (a multiple sting event or anaphylactic response):

If a serious incident occurred/was witnessed, staff should first call in the problem, deal with the immediate threat, and then follow up with the written account to insure proper documentation. The first order of priority is to:

1. Get yourself and all able bodies out of harm's way
2. Start scanning for potential victims, take in the scene
3. Contact Base via radio (so ALL STAFF know what has happened and can begin to mobilize and Base can call for emergency services)
4. Extricate victims (this may involve donning a bee suit and spraying soapy water, or merely verbally encouraging someone to keep running)
5. Get patient(s) to safety and to contingency resources (i.e. VC, ambulance, etc. via litter or rapid foot travel)

Base should acquire the following information:

- reporting party name/contact
- number of victims, approximate age of victims
- number of stings per victim and/or number of bees involved
- location of victim
- status of other visitors and available staff
- response plan

Base will then contact Emergency Services and relay any pertinent information-- number of patients, number of stings, and age of victim(s).

Contact: ***Tonto Basin Fire Department at 928-479-2333, or
Gila County Dispatch for Tonto Basin (Payson) 866-866-4452 ext 1, or
Gila County Dispatch for Tonto Basin (Globe) 1-800-635-8017ext 1***

After acquiring the proper information and calling for emergency medical assistance, Base will mobilize staff to vacate a staging area where both victims and rescuers can safely await the ambulance. Base will also attempt to organize additional rescuers to support initial response personnel. When responding, the degree and type of response will be situational and based upon the individual victim's medical condition, the severity of the attack, and the location at which the attack has occurred.

In the front-country, emergency response will be required when the victim of a bee attack is exhibiting any adverse medical response (i.e., anaphylaxis), or has suffered multiple stings. Local ambulance transport will be called to assist staff in the treatment of any victim, and to provide transport to medical facilities. If extrication from an area is required, this will be done only by individuals who have been trained in the use of protective equipment (bee suits and backpack sprayers), and who will utilize this equipment during the extrication process.

In the back-country, extrication or treatment of individuals affected (bee attack or adverse reaction to a bee sting) will utilize emergency back-country evacuation procedures to remove the victim, and to provide treatment and transport in the quickest available form.

Park Basic First Aiders, WFRs, and EMTs will be trained in bee sting response, and will be able to provide treatment for shock as well as basic life support functions. EMTs and WFRs will be certified in the use of Epinephrine. All staff will be trained on the use of an EPI pen to be able to instruct others. All personnel will receive training in basic life support, victim protection, and evacuation.

Prevention of AHB Incidents

Education and training of Park staff is important for reducing the threat of injury from AHB attack. AHB personnel will receive training to better understand normal versus aggressive behavior, and distinguish high activity from legitimate safety threats. This experience will help relieve apprehension about AHBs and help staff to make appropriate decisions. A directed annual training will be conducted in the early spring for all available employees, and a general bee training will be provided for seasonal employees during their orientation. The Park will also continue to issue bee hoods to all personnel who work outside, and ensure the staff knows how to use them.

Visitors must also be educated to the potential hazards of AHBs. The Interpretive division has produced (and will update as needed) a half page hand out on AHBs with information provided by the Resources Management Division that includes how to respond to a bee attack. Also, any new informational signs at trailheads or the visitor center will include a caution regarding AHBs. Visitors will be directed away from known colonies with signs, verbal warnings, and personnel present at the closed areas.

The Park will ensure facilities are safe for employees and visitors. In addition to staff eradicating hives, the Maintenance Division will bee-proof facilities as colonies are removed. As time and resources allow, the Maintenance Division will remove potential hazards identified. Also, the hazards and attractants identified during annual Park safety inspections will be corrected.

See the University of Arizona Agriculture Department Honey Bee Information (on file at Tonto National Monument) for additional advice on protecting yourself in a bee attack, bee-proofing, and honey bee facts. Also, this plan will be updated by the Park's AHB personnel as necessary to reflect changes in the AHB situation in southern Arizona, or to make changes or improvements in plan policy or actions based on experience dealing with AHBs.

Integration of Actions

A combination of prevention and eradication is needed to manage AHB populations. Preventative actions and mechanical eradication are basic elements of the program and will precede chemical eradication. The IPM method involves monitoring AHB activity; finding and assessing reported AHB colonies; and applying the minimum eradication method necessary.

Treatment should be carried out during cold periods (mornings, evenings, or cool seasons) when AHBs have the most difficulty flying or are inactive. Colonies are smaller in winter and treatment at this time reduces the risk of stinging. Public closure of areas may be required unless treatment is applied during off-visitation hours.

With proper implementation of the IPM process, the park should prevent most, if not all, AHB-human conflicts. This reduces the need for an emergency response, and provides for the greater safety of all visitors and staff in the park.

References

National Park Service, Saguaro National Park. March, 2009. Integrative Pest Management Action Plan for African Honey Bees. Tucson, AZ.

National Park Service, Tonto National Monument. April, 2009. Briefing Statement: Africanized Bees at Tonto National Monument. Roosevelt, AZ.

Sensible Alternatives For the Environment, Dr. Gordon Wordell. May 2009. African Honey Bees at Tonto National Monument. Tucson, AZ.

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Compliance

Tonto National Monument is in the process of writing a comprehensive Integration Pest Management Plan that will include management of African Honey Bees. This plan will likely not be completed or approved until 2011. The AHB problem at Tonto warrants immediate attention owing to the current safety threats. To deal with this threat, an interim plan has been initiated and a Categorical Exclusion E.3 (Removal of park resident individuals of non-threatened/endangered species which pose a danger to visitors, threaten park resources or become a nuisance in areas surrounding a park, when such removal is included in an approved

resource management plan). An Environmental Screening Form was also completed with No Effects. Consultation with the State Historic Preservation Office and with interested tribes will have to occur before any new crack or crevice-sealing can occur on the LCD rock face.

APPENDIX D: REGULATIONS, POLICIES AND GUIDELINES REGARDING THE USE OF PESTICIDES IN NATIONAL PARKS

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 TNM 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 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 TONT 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 TONT, 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. (Further NPS-specific detail is provided below under the heading of NPS Directors Orders.)

- 1892 Executive Order 6144-'92 (June 22, 2892 – No. 28A)
- 1916 National Park Service Organic Act
- 1907 National Monument Proclamation for Tonto National Monument
- 1937 Tonto 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
- 1964 Wilderness 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) are 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

Tonto 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>.

