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In Reply Refer to:
AESO/SE
22410-2008-F-0451

April 2, 2009

Ms. Jeanine A. Derby
USDA, Forest Service
Coronado National Forest, Supervisor's Office
300 West Congress
Tucson, Arizona 85701

RE: Huachuca FireScape Project

Dear Ms. Derby:

Thank you for your request for formal consultation with the U.S. Fish and Wildlife Service (FWS) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (Act). Your request was dated July 31, 2008, and was received by us on August 4, 2008. At issue are impacts that may result from the proposed implementation of the Huachuca FireScape Project (Proposed Action) on the Sierra Vista Ranger District of the Coronado National Forest, on the Coronado National Memorial, and on Fort Huachuca in Cochise and Santa Cruz counties, Arizona. The proposed action will adversely affect the:

- threatened Mexican spotted owl (*Strix occidentalis lucida*) and the species' critical habitat; and
- endangered Sonoran tiger salamander (*Ambystoma tigrinum stebbinsi*).

Your July 31, 2008, letter also requested our concurrence that the proposed was not likely to adversely affect the:

- endangered jaguar (*Panthera onca*);
- endangered lesser long-nosed bat (*Leptonycteris curasoae*);
- threatened Chiricahua leopard frog (*Lithobates chiricahuensis*);
- endangered Gila chub (*Gila intermedia*);
- endangered Gila topminnow (*Poeciliopsis occidentalis occidentalis*);
- endangered Huachuca water umbel (*Lilaeopsis schaffneriana* var. *recurva*);

- endangered Canelo Hills ladies' tresses (*Spiranthes delitescens*); and
- Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*).

We concur with your determinations and provide our rationale in Appendix A.

This biological opinion is based on information provided in the: (1) July 22, 2008, Huachuca FireScape Project Biological Assessment (BA), transmitted with your July 31, 2008, letter; (2) proceedings of various meetings and electronic mail exchanges between my staff and the FireScape project team; and (3) various published and unpublished sources of information. Literature cited in this biological opinion is not a complete bibliography of all literature available on the species of concern, and its effects, or on other subjects considered in this opinion. A complete administrative record of this consultation is on file at this office.

Also note that this biological opinion does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat at 50 CFR 402.02. Instead, we have relied upon the statute and the August 6, 2004, Ninth Circuit Court of Appeals decision in *Gifford Pinchot Task Force v. U.S. Fish and Wildlife Service* (No. 03-35279) to complete our analyses with respect to critical habitat.

Consultation History

December 14, 2006: My staff discussed scope of the project and the need for formal consultation and biological opinion with your staff via electronic mail.

February 28, 2007: My staff participated in an Interdisciplinary Team (ID Team) conference call wherein inclusion of wildland fire use on Coronado National Memorial and within the Huachuca FireScape Project could affect the consultation process.

August 23, 2007: My staff received copies of the public comments made in response to public scoping notice of the Huachuca FireScape Project from your staff via electronic mail.

January 8, 2008: My staff received a copy of draft Environmental Assessment and latest draft design features/conservation measures from your staff via electronic mail.

January 10, 2008: Your staff met with my staff to discuss the design features/conservation measures to be adopted in the proposed action, species to be addressed, and the consultation process.

January 30, 2008: My staff received updated design features/conservation measures for the Huachuca FireScape project from your staff via electronic mail.

February 8, 2008: Our respective staffs discussed design features for Mexican Spotted Owl in regards to treatments in Primary Activity Centers (PAC) and core areas, with our guidance being to continue to defer treatments in the core area. We also reviewed monitoring guidance of the Mexican Spotted Owl Recovery Plan.

August 4, 2008: We received your July 31, 2008, letter requesting formal interagency consultation on the proposed action.

November 21, 2008: We transmitted a letter (File number 22410-2008-F-0451) requesting a 60-day extension of the consultation period on the proposed action.

December 3, 2008: You transmitted a letter in reply to our November 21, 2008, granting the extension and requesting the final biological opinion by no later than February 1, 2009.

March 13, 2009: We transmitted a draft biological opinion on the proposed action to you.

March 20, 2009: Coronado National Forest and Coronado National Memorial staff transmitted their agencies' respective comments on the March 13, 2009, draft biological opinion to us via electronic mail.

March 23, 2009: Fort Huachuca staff transmitted the agency's comments on the March 13, 2009, draft biological opinion to us via electronic mail.

BIOLOGICAL OPINION

Description of the Proposed Action

The proposed action is described in detail within the BA. The following narrative, transcribed in part from the BA, represents a brief summary.

The proposed action is the implementation of projects resulting from unified planning for fire and fuel reduction activities among the Forest Service (Coronado National Forest), the Department of Defense (DOD-Fort Huachuca) and the National Park Service (NPS-Coronado National Memorial) in the Canelo Hills, San Rafael, and Huachuca, Patagonia, and Whetstone Mountains of southeastern Arizona. The project is intended to increase fire management flexibility, efficiency, and consistency across about 400,000 acres of adjoining Federal lands. The proposed action includes both prescribed fire and non-fire treatments that are designed to address conditions specific to ecological units (EU) across various land management jurisdictions within the project area. Non-fire treatments include a variety of options for thinning dense stands of trees and shrubs, reducing surface and ladder fuels, and creating openings in forest canopy where it exists. The treatments proposed are purposely generic, so that they can be used as ground conditions, weather, budgets and resources allow.

Each proposed activity applies a defined prescription (a plan that describes what and how much vegetation should be manipulated) and a cost-efficient treatment (a method to achieve the prescription). General prescriptions are determined by ecological unit characteristics and are intended to reduce surface fuels, ladder fuels, and the density of trees and shrubs. Weather factors, limited operating periods, and available funding would dictate the amount and type of activities that might be applied in any given year.

Table 4 (reproduced below) and Figure 2 from the BA display the proposed treatment methods and acres by ecological unit. Note that the acreages in Table 4 show the potential maximum amount of acres that are available to be treated by each EU by each type of treatment method over the estimated 10-year implementation period within the limitations shown.

BA Table 4. Mechanical and fire treatment and removal method combinations proposed for the Huachuca FireScape Project. Total treatment acres represent the potential maximum acres that could be treated over the estimated 10-year implementation period.

Ecological Unit	**Size of EU (acres)**	**Total acres available for treatment (all acres may be treated by prescribed burn)**	**Acres within the total acres that may also be subject to thin by hand, chip, remove, handpile and burn treatments**	**Acres within the total acres that may also be subject to mastication treatments**	**Acres that will not be treated**
EU-1 Low gradient riparian systems[1]	130	0	0	0	130
EU-2 Chihuahuan desert scrub, mostly limey or saline alluvial fans or terraces	16,655	5,000	500	5,000	11,655
EU-3 Grasslands on dissected alluvial fans and plains. Includes a limited number of moderate gradient, relatively narrow, sycamore dominated riparian systems.	49,295	40,000	1,000	5,000	9,295
EU-5 Mostly oak savanna (with some oak woodlands on microsites), dissected alluvial fans	56,695	45,000	1,000	10,000	11,695
EU-6 Oak savanna and open woodlands on granite hills	26,140	10,000	500	4,000	16,140
EU-7 Oak savanna and woodland, volcanic hills and low mountains	49,415	40,000	500	5,000	9,415
EU-8 Oak savanna and woodland granite mountains	23,155	10,000	500	2,000	13,155
EU-9 Grass-chaparral and oak savanna on limestone dominated hills and low mountains	41,265	20,000	500	5,000	21,265
EU-10 Oak-pine woodland, limestone mountains. Includes some pine-oak woodland and mixed conifer on steep north aspects and canyons	20,455	10,000	500	2,000	10,455
EU-11 Pine-oak woodland on granitic hills and low mountains	17,645	15,000	1,000	3,000	2,645
EU-12 Mixed conifer, pine, and pine-oak woodlands on high elevation limestone and quartzite dominated mountains	29,360	15,000	500	1,000	14,360
EU-13 Sensitive higher gradient streams (line segments) nested within EUs 5, 10, 11 and 12 (23 mi) [1]	0	0	0	0	0
EU-14 Dominantly mesquite grasslands associated with granite influenced, often dissected alluvial fans	51,255	40,000	500	5,000	11,255
EU-15 Grass-chaparral, grassland and oak woodland, limestone dominated mountains	25,435	20,000	500	5,000	5,435
Total	406,900	270,000	7,500	52,000	136,900

1 Although no treatment is occurring in these areas, EUs 1 and 13 are shown in the table to acknowledge the existence of the ecological units in the project area. EU 13 is measured in linear miles.

Table 5 in the BA (reproduced below) shows the approximate annual accomplishments that are anticipated to occur. These range from 10,000 to 20,000 acres of prescribed fire, 100 to 500 acres of treatments by hand crews, and 5,000 to 10,000 acres of mechanical treatments. Actual treatment acres may vary from year to year. Projects would be implemented incrementally over approximately 10 years.

BA Table 5. Range of acres to be treated annually by treatment type

Treatment Type	Range of acres treated annually
Prescribed Fire	10,000 to 20,000
Hand Treatments	100 to 500
Mechanical	5,000 to 10,000

Non-Fire Treatments

The following list provides descriptions of the non-fire treatments that would be used. During all hand or mechanical vegetation treatments in both the wildland-urban interface (WUI) and non-WUI areas, treatments would be concentrated on removing the most hazardous fuels.

Chipping - A stationary machine would be used to chip small trees, limbs, brush, and dead woody fuel. Chipped material would be spread over the treated area or loaded into a vehicle and transported to an offsite location for other uses. Chipping would be applied on slope angles of 30 percent or less.

Lop and Scatter - Lopping and scattering may be needed to facilitate prescribed burning. Felled trees and shrubs would be limbed, lopped, and bucked using chainsaws so that slash would lie close to the ground, then the slash would be spread more or less evenly over the ground.

Masticate - Mastication helps to moderate fire behavior by reducing fuel bed depth. To accomplish this, a tracked or rubber-tired machine chops, shreds, and/or grinds small trees, limbs, shrubs, and dead woody debris into chips to be left on site. The treated woody material that results is generally less than 3 feet long and not more than 6 inches in height. Mastication would be limited to areas where slope angles are 30 percent or less.

Pruning Trees - This treatment may be applied along major system road corridors, within fuelbreaks or in conjunction with fire control lines to remove ladder fuels and facilitate prescribed burning. Tree branches would be pruned using hand tools and chainsaws as close to the tree bole as possible without damaging the bole. Trees generally would be pruned no higher than 10 feet above ground level or one-third the tree height, whichever is less.

Thin by Hand - This method of thinning trees and shrubs would involve the use of hand-tools or chainsaws to create a prescribed spacing. Trees selected for thinning would depend upon treatment objectives as well as tree-hazard rating, snag recruitment, health and vigor, species, size, and age, in descending order of importance. Each factor would be weighed when selecting which trees to be cut and those to remain ("leave trees"). Species preference, size classes, and residual stocking levels for tree thinning would be determined on a project unit level and would be designed to achieve the desired future condition for the EU. Selection thinning would be used to favor keeping larger and older trees in uneven-aged stands, and retaining the most fire-resistant tree species and sizes while maintaining species diversity. Horizontal spacing would

vary based on tree density, species composition, and slope. Cut trees may be made available to the public for utilization as firewood.

Shrubs would be thinned to a minimum horizontal distance between individual or small clumps of shrubs, depending upon the slope. Horizontal spacing would vary based on shrub density, species composition, and slope. Within the structure defense zone space (from 0 to 300 feet from existing structures), vegetation treatments may be more intense.

Removal - Cut trees and shrubs, pruned limbs and dead and down woody debris would be removed by hand or machine to an off-site location for utilization or burning.

Fire Treatments

Prescribed Fire - Prescribed fire would be used to: (1) minimize the potential for unwanted wildfires by reducing surface and ladder fuels and breaking up contiguous vegetation; (2) help restore historic fire patterns and frequencies; and (3) help improve forest health, wildlife habitat, meadows, and livestock forage. Burning would be accomplished by applying low- to moderate-intensity fire using hand, mechanical or aerial firing methods. Prescribed burning would be accomplished when conditions are favorable and risk of fire escape is low.

Handpile and Burn - Cut trees, shrubs, pruned limbs, and dead and down woody material generally no smaller than 1 inch in diameter would be piled by hand and burned. Burning would occur when conditions are favorable and risk of fire spread is low. Piles would range from about 5 feet in diameter and 4 feet high to approximately 15 feet in diameter and 8 feet high, and would be located away from residual trees and shrub patches to minimize scorch to the canopies and trunks of trees.

Fire Control Line - Fire control lines (firelines) would be used to facilitate prescribed broadcast burning and handpile burning operations. Fireline construction may consist of removing herbaceous vegetation, pruning, or cutting breaks in the fuel by hand and clearing all vegetation from a strip about 3 feet in width down to mineral soil. Individual piles or groups of piles may have fireline cut around them or have the surrounding vegetation wet down with a fire hose to minimize creeping. Firelines would be rehabilitated, which may include pulling removed material back into the lines, hand constructing water diversion channels, or laying shrubs or woody debris in the lines following burning. Fire control lines may also consist of natural barriers, roads, and trails.

Description of the Proposed Conservation Measures

The BA includes design features intended to avoid and minimize the effects of the proposed action on a Ecological Unit by unit basis. These measures are described in Appendix C of the BA (see Wildlife, Fish, and Plant Habitats section, and are incorporated herein via reference. Measures developed for the protection of other resources (i.e. cultural and historical resources) may also provide for the protection of wildlife, fish, and plants and thus are considered an integral part of this analysis

You have also proposed conservation measures specific to the Mexican spotted owl and its critical habitat, and to the Sonoran tiger salamander. These measures are described below.

Proposed Conservation Measures for the Mexican Spotted Owl

Prescribed fire (preferably low to moderate-intensity) would be used to maintain and enhance Mexican spotted owl habitat inside and outside of the Protected Activity Centers (PAC) by varying the management prescriptions to:

- reproduce natural disturbance patterns
- maintain native vegetation in the landscape, including early seral species
- allow natural gap processes to occur, thus producing horizontal variation in stand structure
- reduce fuels to promote future low to moderate-intensity fire in PACs and adjacent areas.
- Survey PACs for occupancy per protocol (USDA Forest Service 1996) and determine location of nest tree/delineate core area prior to implementing treatments within the PAC
- Within occupied PAC implement prescribed fire and mechanical treatments outside breeding season: March 1 – August 31

Conservation Measures - Protected Activity Centers (per Mexican Spotted Owl Recovery Plan)

Treat fuel accumulations to abate fire risk.

- Select up to 10% of the PACs within each Recovery Unit that exhibit high fire risk conditions. Nest sites must be known within these PACs. Ideally, a paired sample of PACs should be selected to serve as control areas.
    1. Within each selected PAC, designate 40 ha (100 acres) centered around the nest site. This nest area should include habitat that resembles the structural and floristic characteristics of the nest site. These 40 ha (100 acres) will be deferred from the treatments described below.
    2. Within the remaining 203 ha (500 acres), combinations of thinning trees less than 22.4 cm (9 inches) dbh, treatment of fuels, and prescribed fire can be used to reduce fire hazard and to improve habitat conditions for owl prey. Habitat components that should be retained or enhanced include large logs (greater than 30 cm [12 inches] midpoint diameter), grasses and forbs, and shrubs. These habitat components are strong correlates of the presence of many key prey species of the owl. Emphasis of the spatial configuration of treatments should be to mimic natural mosaic patterns.
    3. Treatments can occur only during the non-breeding season (1 September- 28 February) to minimize any potential deleterious effects on the owl during the breeding season.
    4. Following treatments to 10% of the PACs, effects on the owl, prey species, and their habitats should be assessed. If such effects are nonnegative, an additional sample of PACs may be treated. If negative effects are detected, these effects must be carefully evaluated. If they can be ameliorated by modifying treatments, those modifications should occur prior to treatment of additional PACs. If not, no additional treatments should be permitted.
- Within the remaining PACs, light burning of ground fuels may be allowed within the 500 acres surrounding the 100-acre PAC centers

- Resource advisors would be consulted when making decisions about prescribed fire activities. Advisors would be notified if Mexican spotted owls are discovered during fire operations.
- Prescribed fire and mechanical thinning treatments would be conducted to minimize effects on reproduction; actions with known potential for negative effects to Mexican spotted owl and Mexican spotted owl habitat (protected and reserve) would be avoided.
- Mexican spotted owl Recovery Plan (FWS 1995) pine-oak forest habitat structure guidelines would be followed in setting project objectives. These guidelines stress maintaining large trees (greater than 18 inches dbh), snags, and downed logs (greater than 16 inches in diameter).
- Staging areas and other "activity centers" would be located more than a mile from designated PAC boundaries during the breeding season (March 1 – August 31).

As activities are proposed, fire and fuels managers will review treatment parameters to ensure that they are within the scope of the FireScape strategy and effects analysis and that they are consistent with the design features that bind those actions. Such prescreening will help to assess whether the effects of treatments fall within acceptable boundaries.

Proposed Conservation Measures for the Sonoran Tiger Salamander

The following measures have been proposed to avoid and minimize the effects of the proposed action on the Sonoran tiger salamander.

- High-intensity fire shall be avoided near occupied stock tanks and within the drainage feeding the tanks.
- No water would be drafted for fire (prescribed fire) control activities from bodies of water known to be occupied by the Sonoran tiger salamander.
- Areas of significant human activity during prescribed fire activities, such as fire crew camps, landing strips, and equipment staging areas, shall not be located on or adjacent to salamander breeding sites and should be located at least 1,650 feet away from such sites unless absolutely necessary for fire control.
- A resource advisor would be present or available during all prescribed fire in salamander habitat areas. Resource advisors would be qualified - to address Sonoran tiger salamander concerns, serve as an advisor to the fire boss, and coordinate with FWS.
  Implement the conservation measures for fire management activities in riparian and aquatic habitats as described in the riparian, aquatic and wetland protection measures (BA Appendix C).
- See also BA Appendix C: Conservation Measures for Wildlife, Fish, and Plant Habitats - General Protections Measures.

Status of the Species and Critical Habitat – Mexican Spotted Owl

The Mexican spotted owl was listed as a threatened species in 1993 (FWS 1993). The primary threats to the species were cited as even-aged timber harvest and stand-replacing wildfire, although grazing, recreation, and other land uses were also mentioned as possible factors

influencing the Mexican spotted owl population. The Fish and Wildlife Service appointed the Mexican Spotted Owl Recovery Team in 1993, which produced the Recovery Plan for the Mexican Spotted Owl (Recovery Plan) in 1995 (FWS 1995). Critical habitat was designated for the Mexican spotted owl in 2004 (FWS 2004).

A detailed account of the taxonomy, biology, and reproductive characteristics of the Mexican spotted owl is found in the Final Rule listing the Mexican spotted owl as a threatened species (FWS 1993) and in the Recovery Plan (FWS 1995). The information provided in those documents is included herein by reference. Although the Mexican spotted owl's entire range covers a broad area of the southwestern United States and Mexico, the Mexican spotted owl does not occur uniformly throughout its range. Instead, it occurs in disjunct localities that correspond to isolated forested mountain systems, canyons, and in some cases steep, rocky canyon lands. Surveys have revealed that the species has an affinity for older, uneven-aged forest, and the species is known to inhabit a physically diverse landscape in the southwestern United States and Mexico.

The U.S. range of the Mexican spotted owl has been divided into six recovery units (RU), as discussed in the Recovery Plan. The primary administrator of lands supporting the Mexican spotted owl in the United States is the Forest Service. Most owls have been found within Forest Service Region 3 (including 11 National Forests in Arizona and New Mexico). Forest Service Regions 2 and 4 (including two National Forests in Colorado and three in Utah) support fewer owls. According to the Recovery Plan, 91 percent of Mexican spotted owls known to exist in the United States between 1990 and 1993 occurred on lands administered by the Forest Service.

Historical and current human uses of Mexican spotted owl habitat include domestic ungulate grazing, recreation, fuels reduction treatments, resource extraction (e.g., timber, oil, gas), and development. These activities have the potential to reduce the quality of Mexican spotted owl nesting, roosting, and foraging habitat, and may cause disturbance during the breeding season. Livestock and wild ungulate grazing is prevalent throughout Region 3 National Forest lands and is thought to have a potentially negative effect on the availability of grass cover for prey species. Recreation impacts are increasing on all forests, especially in meadow and riparian areas. In southern Arizona, close to the border, large numbers of undocumented migrants and drug traffickers create trails, build fires, and leave behind them huge piles of trash. Lay over sites are frequently hidden beneath dense tree canopy in canyon bottoms, often within PACs. Fuels reduction treatments, though critical to reducing the risk of severe wildfire, can have short-term adverse effects to Mexican spotted owl through habitat modification and disturbance. As the population grows, especially in Arizona, small communities within and adjacent to National Forest System lands are being developed. This trend may have detrimental effects to Mexican spotted owl by further fragmenting habitat and increasing disturbance during the breeding season. West Nile Virus also has the potential to adversely impact the Mexican spotted owl. The virus has been documented in Arizona, New Mexico, and Colorado, and preliminary information suggests that owls may be highly vulnerable to this disease (Courtney *et al.* 2004). Unfortunately, due to the secretive nature of owls and the lack of intensive monitoring of banded birds, we will most likely not know when owls contract the disease or the extent of its impact to Mexican spotted owl range-wide.

Currently, high-intensity, stand-replacing fires are influencing ponderosa pine and mixed conifer forest types in Arizona and New Mexico. Uncharacteristic, severe, stand-replacing wildfire is probably the greatest threat to Mexican spotted owls within the action area. As throughout the West, fire severity and size have been increasing within this geographic area (Graham *et al*. 2004).

A reliable estimate of the numbers of owls throughout its entire range is not currently available (FWS 1995) and the quality and quantity of information regarding numbers of Mexican spotted owls vary by source. FWS (1991) reported a total of 2,160 owls throughout the United States. Fletcher (1990) calculated that 2,074 owls existed in Arizona and New Mexico. However, Ganey *et al.* (2000) estimates approximately 2,950 ± 1,067 (SE) Mexican spotted owls in the Upper Gila Mountains RU alone. The Forest Service Region 3 most recently reported a total of approximately 1,025 PACs established on National Forest System (NFS) lands in Arizona and New Mexico (B. Barrera, pers. comm. June 18, 2007). The FS Region 3 data are the most current compiled information available to us; however, survey efforts in areas other than NFS lands have resulted in additional sites being located in all Recovery Units.

Researchers studied Mexican spotted owl population dynamics on one study site in Arizona (n = 63 territories) and one study site in New Mexico (n = 47 territories) from 1991 through 2002. The Final Report, titled "Temporal and Spatial Variation in the Demographic Rates of Two Mexican Spotted Owl Populations," (*in press*) found that reproduction varied greatly over time, while survival varied little. The estimates of the population rate of change (Λ=Lamda) indicated that the Arizona population was stable (mean Λ from 1993 to 2000 = 0.995; 95 percent Confidence Interval = 0.836, 1.155) while the New Mexico population declined at an annual rate of about 6 percent (mean Λ from 1993 to 2000 = 0.937; 95 percent Confidence Interval = 0.895, 0.979). The study concludes that spotted owl populations could experience great (>20 percent) fluctuations in numbers from year to year due to the high annual variation in recruitment. However, due to the high annual variation in recruitment, Mexican spotted owl populations are then likely very vulnerable to actions that impact adult survival (e.g., habitat alteration, drought, etc.) during years of low recruitment.

Since the owl was listed, we have completed or have in draft form a total of 205 formal consultations for the Mexican spotted owl. These formal consultations have identified incidences of anticipated incidental take of Mexican spotted owl in 413 PACs. The form of this incidental take is almost entirely harm or harassment, rather than direct mortality. These consultations have primarily dealt with actions proposed by Forest Service Region 3. However, in addition to actions proposed by Forest Service Region 3, we have also reviewed the impacts of actions proposed by the Bureau of Indian Affairs, Department of Defense (including Air Force, Army, and Navy), Department of Energy, National Park Service, and Federal Highway Administration. These proposals have included timber sales, road construction, fire/ecosystem management projects (including prescribed natural and management ignited fires), livestock grazing, recreation activities, utility corridors, military and sightseeing overflights, and other activities. Only two of these projects (release of site-specific owl location information and existing forest plans) have resulted in biological opinions that the proposed action would likely jeopardize the continued existence of the Mexican spotted owl. The jeopardy opinion issued for existing Forest Plans on November 25, 1997 was rendered moot because a non-jeopardy/no adverse modification BO was issued the same day.

In 1996, we issued a biological opinion on FS Region 3 adoption of the Recovery Plan recommendations through an amendment to their Land and Resource Management Plans (LRMPs). In this non-jeopardy biological opinion, we anticipated that approximately 151 PACs would be affected by activities that would result in incidental take of Mexican spotted owls. In addition, on January 17, 2003, we completed a reinitiation of the 1996 Forest Plan Amendments biological opinion, which anticipated the additional incidental take of five Mexican spotted owl PACs in Region 3 due to the rate of implementation of the grazing standards and guidelines, for a total of 156 PACs. Consultation on individual actions under these biological opinions anticipated incidental take in the form of harm and/or harassment of owls associated with 243 PACs on Region 3 NFS lands. FS Region 3 reinitiated consultation on the LRMPs on April 8, 2004. On June 10, 2005, the FWS issued a revised biological opinion on the amended LRMPs. We anticipated that while the Region 3 Forests continue to operate under the existing LRMPs, take is reasonably certain to occur to an additional 10 percent of the known PACs on NFS lands. We expect that continued operation under the plans will result in harm to 49 PACs and harassment to another 49 PACs. To date, consultation on individual actions under the amended Forest Plans, as accounted for under the June 10, 2005, biological opinion has resulted in the incidental take of owls associated with 40 PACs. Incidental take associated with Forest Service fire suppression actions, which was not included in the LRMP proposed action, has resulted in the incidental take of owls associated with 15 PACs.

Mexican spotted owl critical habitat

The final Mexican spotted owl critical habitat rule (FWS 2004) designated approximately 8.6 million acres of critical habitat in Arizona, Colorado, New Mexico, and Utah, mostly on Federal lands (FWS 2004). Within this larger area, critical habitat is limited to areas that meet the definition of protected and restricted habitat, as described in the Recovery Plan. Protected habitat includes all known owl sites and all areas within mixed conifer or pine-oak habitat with slopes greater than 40 percent where timber harvest has not occurred in the past 20 years. Restricted habitat includes mixed conifer forest, pine-oak forest, and riparian areas outside of protected habitat.

The primary constituent elements for proposed Mexican spotted owl critical habitat were determined from studies of their habitat requirements and information provided in the Recovery Plan (FWS 1995). Since owl habitat can include both canyon and forested areas, primary constituent elements were identified in both areas. The primary constituent elements which occur for the Mexican spotted owl within mixed-conifer, pine-oak, and riparian forest types that provide for one or more of the Mexican spotted owl's habitat needs for nesting, roosting, foraging, and dispersing are in areas defined by the following features for forest structure and prey species habitat:

Primary constituent elements related to forest structure include:

A range of tree species, including mixed conifer, pine-oak, and riparian forest types, composed of different tree sizes reflecting different ages of trees, 30 percent to 45 percent of which are large trees with diameter-at-breast height (dbh) of 12 inches or more;

A shade canopy created by the tree branches covering 40 percent or more of the ground; and,

Large, dead trees (snags) with a dbh of at least 12 inches.

Primary constituent elements related to the maintenance of adequate prey species include:

High volumes of fallen trees and other woody debris;
A wide range of tree and plant species, including hardwoods; and

Adequate levels of residual plant cover to maintain fruits and seeds, and allow plant regeneration.

The forest habitat attributes listed above usually are present with increasing forest age, but their occurrence may vary by location, past forest management practices or natural disturbance events, forest-type productivity, and plant succession. These characteristics may also be observed in younger stands, especially when the stands contain remnant large trees or patches of large trees. Certain forest management practices may also enhance tree growth and mature stand characteristics where the older, larger trees are allowed to persist.

Environmental Baseline – Mexican Spotted Owl

The environmental baseline includes past and present impacts of all Federal, State, or private actions in the action area, the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the impact of State and private actions which are contemporaneous with the consultation process. The environmental baseline defines the current status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consultation.

Description of the Action Area

The action area for the proposed action includes the areas encompassed by Mexican spotted owl PACs proposed for treatment within the Huachuca, Whetstone, and Patagonia mountain ranges (see BA Tables 2 and 7).

The action area is within the Basin and Range-West Recovery Unit as described in the Mexican Spotted Owl Recovery Plan. Subunits BR-W-14, BR-W-15, and BR-W-16 are fully contained within the action area. Subunit BR-W-14 consists of 56,756 acres within the Patagonia Mountains, Subunit BR-W-15 consists of 53,845 acres within the Huachuca Mountains (19,450 acres within this subunit fall within the Miller Peak Wilderness and, although not part of the project area, are considered as part of the action area), and Subunit BR-W-16 consists of 21,151 acres within the Whetstone Mountains.

A total of 31 Mexican spotted owl PACs currently are designated in the Huachuca Mountains, Whetstone, and Patagonia Mountains. Fort Huachuca contains a small inventory area (IA), which is defined as suitable, potential Mexican spotted owl breeding and foraging habitat.

No areas meeting the definition of restricted habitat (FWS 1995) occur within the action area outside of designated PACs with the one exception being a 255-acre area, defined as potential

Mexican spotted owl breeding and foraging habitat, on Fort Huachuca.

Status of the species and critical habitat within the action area – Mexican spotted owl

Accessible forest (primarily foraging habitat) in many areas have had the mature stand component partially or completely harvested. In general, however, much of the habitat is forested steep-slope canyons and drainages, and is mostly in suitable condition. Within the Sky Islands, habitat is characterized by a greater amount of woodland habitat, and territories occur in both heavily forested terrain and in areas with hardwood and conifer stringers dominated by Madrean Evergreen woodland. The primary threats to the spotted owl within this recovery unit are catastrophic wildfire, recreation, and grazing (FWS 1995). Within the project area, many PACs have been affected by fire within the past 33 years (see Table 7 in the BA). Overall, recent fires have occurred in 20 out of 31 (65%) of the PACs in the project area. Of the PACs in which fires burned, all or nearly all the acres burned within six PACs (19%).

The action area contains Mexican spotted owl critical habitat within the Huachuca, Whetstone, and Patagonia mountains (Coronado National Forest and, in part, the Coronado National Memorial). Fort Huachuca's lands within the Huachuca Mountains are, however, excluded because the installation is managed under an approved Integrated National Resource Management Plan (INRMP).

The critical habitat present within the action area is functioning though, like the recovery unit, it exists under threat of catastrophic wildfire, recreation, and grazing. The focus of Mexican spotted owl management is at the scale of a PAC, not a critical habitat unit. Table 7 in the BA, a table of survey data from PACs within the action, is informative only to the extent that there appears to be no systematic decline in Mexican spotted owl occupancy or reproductive success. This inference, however, is based primarily on the more-intensive survey efforts conducted by Fort Huachuca. Fort Huachuca's lands are likely managed differently than those of the Coronado National Forest and Coronado National Memorial, but we have no reason to suspect that trends differ substantively between the jurisdictions.

Critical habitat within the Basin and Range-West Recovery Unit is disjunct, a function of its presence in the Sky Islands of southeastern Arizona and southwestern New Mexico. Moreover, the Madrean Evergreen Woodland component of the critical habitat is unique within the United States. Thus, while the fraction of critical habitat within the action area is small relative to the Recovery Unit and the total amount of critical habitat available, the unique habitat associations render it crucial to the recovery of the Mexican spotted owl.

Factors affecting species environment and critical habitat within the action area – Mexican spotted owl

To date, the largest non-emergency Federal actions implemented within the action area in which Mexican spotted owls were found to be adversely affected are the: (1) ongoing military operations at Fort Huachuca, consulted upon in our June 14, 2007, biological opinion (File numbers 22410-2007-F-0132, 2-21-02- F-229, and 2-21-98-F-266); and (2) the Department of Homeland Security's Tucson West Tower project, consulted upon in our September 4, 2008, biological opinion (File number 22410-2008-F-0373).

We anticipated the incidental take - via harm, harassment, or mortality - of two Mexican spotted owls, or of one nest with eggs or nestlings as a result of the effects of Fort Huachuca's proposed action during the 10-year life of the project. We also anticipated the incidental take of one Mexican spotted owl in the Scheelite Canyon PAC and one Mexican spotted owl elsewhere at Fort Huachuca over the life of the project as a result of harassment due primarily to on-post recreational activities.

We anticipated that the Tucson West Tower Project would affect portions of 3 PACs but that the action would result in no incidental take of Mexican spotted owls.

Effects of the Proposed Action – Mexican Spotted Owl

The proposed action may treat up to approximately 11,600 acres (13,300 acres less the eighteen 100-acre core areas in PACs outside wilderness) out of a total of 23,573 acres within designated PACs in the action area. This represents direct and indirect effects to 38 percent of the total acreage within PACs. Twenty-four PACs (77% of the total number within the action area) are located partially or completely outside wilderness area boundaries and could therefore be subject to treatment.

As previously discussed, the effects of fire and fuel management on Fort Huachuca have already been analyzed in a previous biological opinion. There are 6,730 acres in 11 PACs on Fort Huachuca, which indicates there are 16,843 acres of non-wilderness, non-Fort Huachuca PACs remaining to be treated under the proposed action.

BA Table 1 Acres within PACs potentially available for treatment. Core areas would be delineated at time of project layout.

EU Number	EU description	Acres
12	Mixed conifer, pine, and pine-oak woodlands on high elevation limestone and quartzite dominated mountains	6,849
5	Mostly oak savanna (with some oak woodlands on microsites), dissected alluvial fans	32
8	Oak savanna and woodland granite mountains	1,534
7	Oak savanna and woodland, volcanic hills and low mountains	1,883
10	Oak-pine woodland, limestone mountains. Includes some pine-oak woodland and mixed conifer on steep north aspects and canyons	1332
11	Pine-oak woodland on granitic hills and low mountains	1,612
14	Dominantly mesquite grasslands associated with granite influenced, often dissected alluvial fans	58
	Total	13,300

Carefully designed thinning and burning treatments may enhance habitat quality for Mexican spotted owls, while aggressive treating of adjacent, forest stands can reduce fire hazard across the landscape, thus better protecting owl habitat. Although aggressive thinning may reduce owl habitat quality in a specific location, when examined from a landscape perspective, well-placed thinning and prescribed fire can enhance overall owl habitat quality, both through improving the quality of marginal stands and reducing the likelihood of large losses of habitat from stand-replacing fire (Prather *et al.* 2008).

Activities associated with prescribed burning and thinning treatments can directly affect nesting or wintering Mexican spotted owls through auditory or visual disturbance. This disturbance can disrupt activities such as breeding, feeding, and roosting. Smoke and flames from prescribed fires during the breeding season can cause mortality of owls (particularly young) by burning or by carbon monoxide poisoning (Bond *et al.* 2002). Adult and fledged young may be flushed from their nesting or roosting areas by prescribed burning activities. All of these activities, if they occur during the breeding season, may result in nest abandonment or reduced reproductive success. There were no significant changes to Mexican spotted owl home range size after two prescribed burns outside of their primary nesting and roosting habitat in Saguaro National Park, although small sample sizes and confounding factors limit the conclusions that can be drawn from this data (Willey 1998). Mexican spotted owls nested in moderately burned areas after the Clark Peak wildfire (Scott 1998) and have been observed returning to burned areas where the stand structure has remained intact (Sheppard and Farnsworth 1997). Despite the required minimization measures, proposed activities could still have adverse affects to adult and young owls that may occur in PACs.

The effects of fire include both negative and beneficial effects on spotted owl habitat. Beneficial aspects would include increased response of herbaceous vegetation after a fire. Negative effects would include the loss of spotted owl prey habitat components such as herbaceous cover, down logs and snags. Effects of fire on spotted owl reproduction are also variable. There are anecdotal reports of spotted owls breeding in territories with burned habitat. For instance, Mexican spotted owls nested in areas that had been moderately burned by the 1990 Clark Peak wildfire in southeastern Arizona (Scott 1998). Mexican spotted owls in the Coconino National Forest bred successfully in most years following prescribed burns that did not negatively influence habitat structure (Sheppard and Farnsworth 1997). In a territory close to prescribed burns in ponderosa pine forest of Saguaro National Park in southern Arizona, Mexican spotted owls fledged two young in the year following burning (Anderson and Schon 1998). In mixed-conifer, pine, and pine/oak forests of Arizona and New Mexico, three territories with successful nests were more than 50 percent burned. However, when considered overall, burned sites had lower reproductive success (USFS 2008).

The effects of fire and fuels treatments on the prey base of the spotted owl are complex and dependent on the variations in fire characteristics and prey habitat. Converse *et al.* (2006) found that overall, forest thinning can be expected to increase densities of small mammals in ponderosa pine (*Pinus ponderosa*) forests of northern Arizona, and retention of slash in fuel reduction and forest restoration treatments may further increase small mammal densities in the post-treatment community. However, reduction of shrubs and woody debris with overly frequent prescribed fire entries may reduce small mammal densities. Fire intensity, size, and behavior are influenced by numerous factors such as vegetation type, moisture, fuel loads, weather, season, and topography. Fire can effectively alter vegetation structure and composition thereby affecting small mammal habitat. The initial effects of fire are likely to be detrimental to rodent populations as cover and plant forage species would be reduced. Population responses by small mammals to fire-induced changes in their habitat vary. It has been suggested that increases in forage after prescribed burns may increase Mexican spotted owl prey abundance (Ward and Block 1995; Sheppard and Farnsworth 1997). Fire could increase abundance of shrubby vegetation used by some woodrats (Williams *et al.* 1992). Campbell *et al.* (1977) noted that populations of peromycid mice decreased immediately following fire in an Arizona ponderosa pine forest that removed one-fourth (moderately burned) to two-thirds (severely burned) of the basal area; populations then returned to pre-fire numbers two years following the burn. Further, no differences were found in

rodent populations between moderately and severely burned areas. They concluded that the effects of the fire that they studied were short-term, and the short-term positive numerical responses of mice were attributed to an increase in forage, particularly grasses and forbs after the fire (Ward and Block 1995). Small mammal diversity and densities are typically depressed for one to three years after a fire (Wright and Bailey 1982). Biswell *et al.* (1973) suggested that rodent populations would be less affected during fall fires, because at that time of year rodents have accumulated seed caches that will mitigate loss of food sources. Predation of surviving rodents that are part of the diet of the spotted owl may increase immediately after the fire. In one study in northern California, radio-collared northern spotted owls spent considerable time in burned-over areas. This activity was assumed to be due to easy capture of prey (Patton and Gordon 1995).

The net effect of prescribed fires on spotted owl foraging is unclear: a fire that removes the tree canopy would likely render a portion of the area unusable for foraging by spotted owls, but if the spatial extent of crown loss is limited, a mosaic is created that could provide a diversity of prey for the owl and actually be beneficial (Ward and Block 1995). Because owl prey species evolved in ecosystems where fire was a natural process, it can be assumed that historically, these species survived, and some even benefited from the occurrence of fire. Fire has been excluded from most southwestern ecosystems during the 20th century, resulting in systems where fire behavior may deviate substantially from natural conditions. Effects of fire on small mammals under present environmental conditions are unclear (Ward and Block 1995).

Prescribed burning or thinning activities may indirectly affect the spotted owl by changing the owl's habitat structure (snags, downed logs, woody debris, multi-storied canopies, dense canopy cover, etc.), potentially resulting in relocation of owls. In addition, the proposed activities may change the structure of spotted owl prey species' habitat, affecting the abundance and composition of prey species. Although treatments, especially prescribed burning, may have adverse effects to prey species and their habitat in the short term, the proposed treatments may increase the diversity of vegetative conditions that, in turn, provide for a diverse prey base.

In the General Considerations of Impacts to PACs (FWS 2001), protection of known spotted owl sites is a high priority and may offer the single greatest value to the species' recovery. PACs comprise 100-acre PAC centers around a known (or best possible) nest site and an additional 500 acres of roosting and foraging habitat in close proximity of the nest site. Protection of the 500 acres of the best quality of nesting, roosting and foraging habitat near the nest site may improve nesting success by reducing the amount of energy the pair may need to feed and raise young, decrease the risk of predation from leaving protective cover of suitable habitat and provide alternative nest sites.

Loss of suitable habitat within the boundaries of a PAC could result in decreased foraging opportunities and increase the potential for predation as the owls may venture further from the nest to find prey. The greater amount of habitat lost or modified, the greater the likelihood of significantly disrupting normal behavior patterns such as breeding, feeding and sheltering. As a multitude of factors (seasonal weather patterns, fluctuating prey populations, etc.) influence nesting success of spotted owls and these factors change yearly, the amount of foraging and protective cover a spotted owl pair may need to support reproductive success each year may also change. It is possible that owl pairs that lose a small amount of habitat within the 600-acre PAC may be able to successfully reproduce in good years or make up for this loss by foraging more

often beyond the designated PAC. This minor disruption of behavior patterns may harm the resident owls, but the harm may not be so great that the individual greatly risks predation or mortality due to starvation. However, the greater amount of quality habitat lost, the greater the likelihood that owls risk predation or use more energy than they gain from foraging trips from the nest site.

Effects of the Proposed Conservation Measures

Appendix C in the BA, incorporated herein via reference, summarizes the Design Features intended to avoid and minimize the proposed action's effects to Mexican spotted owls. Design Features WFP 2 through WFP 8 pertain to the retention of forest and understory habitat and will help ensure that treatments are designed to minimize effects to Mexican spotted owl habitat, to individual birds, and to prey. Design Feature WPF 17 is specific to Mexican spotted owls and further conserved habitat for Mexican spotted owls via the implementation of Recovery Plan-based protective measures.

Effects to Critical Habitat

The effects of the proposed action to the primary constituent elements of Mexican spotted owl critical habitat are a subset of those described above and are primarily related to temporary changes in forest structure and prey base abundance composition. We do not anticipate that the proposed action will fundamentally alter forest structure in terms of species composition, tree size, shade, or presence of snags. Design Feature WPF 17 (see BA Appendix C) ensures that the proposed action maintains existing forest structure features required by Mexican spotted owls and promotes the future attainment of such features in areas where it is currently lacking. Specifically, Design Feature WPF 17 proposes that Mexican spotted owl Recovery Plan (U. S. Fish and Wildlife Service 1995) pine-oak forest habitat structure guidelines would be followed in setting project objectives. These guidelines stress maintaining large trees (greater than 18 inches dbh), snags, and downed logs (greater than 16 inches in diameter).

Prey base abundance and availability are, in part, a function of forest structure and while we anticipate temporary decreases due to mortality from prescribed fire, the retention of some downed snags and the lower levels of disturbance to be implemented in PACs will minimize the effects of the change. We also anticipate subsequent increases in rodent biomass due to post-fire vegetative recovery. The effect of the temporary changes in prey base will also be minimized by conducting fire and fuel reduction activities during the Mexican spotted owl's non-breeding season (September 1 – February 28), when nestlings need not be provisioned by adults. These effects to the primary constituent elements are not anticipated to negatively affect the role of the affected critical habitat in the recovery of the Mexican spotted owl.

Cumulative Effects – Mexican Spotted Owl

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Future non-Federal activities within the action area that are reasonably certain to occur include the modification of habitat and disturbance from actions occurring on adjacent ownerships and in-holdings (e.g., road construction, land clearing, logging, fuelwood gathering, recreation). These activities may reduce the quality and quantity of Mexican spotted owl nesting, roosting, and foraging habitat; result in disturbance to breeding Mexican spotted owls; and contribute as cumulative effects to the proposed action. However, because Mexican spotted owls occur predominantly on Federal lands, and because of the role of the respective Federal agencies in administering Mexican spotted owl habitat, actions implemented in the future by non-Federal entities on non-Federal lands are considered to be of minor impact to the overall Mexican spotted owl population. Undocumented aliens and smugglers are likely to cause noise disturbance, often near active nests, and are likely to have caused (and to continue to cause) wildfires. Together, these may have significant impacts on individual Mexican spotted owl PACs and critical habitat.

Conclusion – Mexican Spotted Owl

After reviewing the current status of the Mexican spotted owl, the environmental baseline for the action area, the effects of the proposed Huachuca FireScape action, and the cumulative effects, it is the FWS's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the Mexican spotted owl, and is not likely to destroy or adversely modify designated critical habitat for the species. We present this conclusion for the following reasons:

- Activities associated with prescribed burning and thinning treatments can directly affect the nesting or wintering Mexican spotted owl through auditory or visual disturbance, but avoidance of core areas and implementation of actions in the non-breeding season will minimize the effects of such disturbance.

- Fuel treatments that are strategically located may decrease the likelihood of high-severity fire spreading into critical habitat. The proposed action is designed to reduce the risk of catastrophic wildfire. Catastrophic wildfire is expected to have considerably greater impacts to the species than the proposed action.

- Prescribed burning or thinning activities may indirectly affect the spotted owl by changing the owl’s habitat structure, but the changes are not likely to occur in core areas and are presumed to be arranged in a mosaic pattern.

- Mexican Spotted Owl Recovery Plan (FWS 1995) pine-oak forest habitat structure guidelines would be followed in setting project objectives.

- Well-designed treatments that reduce the extent and severity of wildfires while maintaining suitable owl habitat are likely to be beneficial in the long-term.

- The proposed action may treat up to 11,600 acres (38 percent) of 23,573 acres within designated PACs in the action area. The maximum number of PACs that could be affected by treatments over the life of this plan is 24 (77% of those occurring within the

action area). This number is small compared to the 1,000+ PACs established on Federal lands in Arizona and New Mexico.

- The effects to critical habitat are a subset of the effects described above, and are unlikely to negatively affect the primary constituent elements to the extent that recovery of the species is precluded. These effects are relatively small compared to the 8.6 million acres designated throughout the range of the species.

Our analysis was conducted as if treatments would occur at the most intensive level allowed by the prescriptions while implementing all required minimization measures. Treatment effects would likely be less than that expected under the maximum potential treatment scenario because:

- Site-specific treatments would be designed for each project within the overall Huachuca FireScape project area.

- Resource advisors will coordinate site-specific burn and implementation plans with the U.S. Fish and Wildlife Service and Arizona Game and Fish Department to identify site-specific measures to protect federally listed and sensitive species, and species of concern.

- Maximum manageable areas (MMAs) would be delineated to avoid impacts to sensitive areas.

Status of the Species and Critical Habitat – Sonoran Tiger Salamander

The Sonoran tiger salamander (*Ambystoma mavortium stebbinsi*) is a large salamander with a dark venter and light-colored blotches, bars, or reticulation on a dark background. Snout-vent lengths of metamorphosed individuals vary from approximately 2.6-4.9 inches (Jones *et al.* 1988, Lowe 1954). Larval salamanders are aquatic with plume-like gills and well-developed tail fins (Behler and King 1980). Larvae hatched in the spring are large enough to metamorphose into terrestrial salamanders from late July to early September, but only an estimated 17 to 40 percent metamorphose annually. Remaining larvae mature into branchiates (aquatic and larval-like, but sexually mature salamanders that remain in the breeding pond) or over-winter as larvae (Collins and Jones 1987; James Collins, Arizona State University, pers. comm. 1993). The Sonoran tiger salamander was listed as endangered on January 6, 1997. No critical habitat has been proposed or designated. A final recovery plan was finalized in September 2002. The species was listed as the "Sonora tiger salamander (*Ambystoma tigrinum stebbinsi*)". Common and scientific names used herein follow Crother (2008).

The Sonoran tiger salamander is known from 71 aquatic localities, although not all are currently occupied (U.S. Fish and Wildlife Service 2002 and files, Abbate 1998, Collins and Jones 1987, Collins 1996). During intensive surveys in 1997, from one to 150 Sonoran tiger salamanders were found at 25 stock tanks (Abbate 1998). Populations and habitats are dynamic, thus the number and location of extant aquatic populations change over time, as exhibited by the differences between survey results in 1985 and 1993-1996 (Collins and Jones 1987; Collins

1996; James Collins, pers. comm. 1996). In 1999, the lab of Dr. James Collins, Arizona State University, found Sonoran tiger salamanders at 17 localities (Collins 1999). During surveys by the Arizona Game and Fish Department from 2001-2006, Sonoran tiger salamanders were found at 37 of 139 stock tanks, which were sampled from 1-7 times each. At 23 of 29 tanks where salamanders were found, and which were sampled more than once, salamanders were not found on at least one visit. All sites where Sonoran tiger salamanders have been found are located in Arizona in the Santa Cruz and San Pedro river drainages, including sites in the San Rafael Valley and adjacent portions of the Patagonia and Huachuca mountains in Santa Cruz and Cochise counties. All confirmed historical and extant aquatic populations are found in cattle tanks or impounded Cienégas within 19 miles of Lochiel, Arizona. Salamanders collected from a ciénega at Rancho Los Fresnos in the San Rafael Valley, Sonora, may be *A. m. stebbinsi* (Varela-Romero *et al.*, 1992). However, surveys during 2006-2008 failed to locate additional salamanders and most waters on the ranch are now occupied by non-native bullfrogs, crayfish, green sunfish, and/or black bullhead (trip reports, FWS files).

Historically, the Sonoran tiger salamander probably inhabited springs, ciénegas, and possibly backwater pools of the Santa Cruz River and streams in the San Rafael Valley where permanent or nearly permanent water allowed survival of mature branchiates. The grassland community of the San Rafael Valley and adjacent montane slopes, where all extant populations of Sonoran tiger salamander occur, may represent a relictual grassland and a refugium for grassland species. Tiger salamanders in this area became isolated and, over time, genetically distinct from ancestral *A. m. mavortium* and *A. m. nebulosum* (Jones *et al.* 1995, Storfer *et al.* 2004). The Sonoran tiger salamander apparently has opportunistically taken advantage of available stock tank habitats as natural habitats disappeared (Hendrickson and Minckley 1984) or were invaded by nonnative predators with which the salamander cannot coexist (U.S. Fish and Wildlife Service 2002).

Although most records for Sonoran tiger salamanders occur at stock tanks where breeding occurs, terrestrial metamorphs potentially may wander considerable distances from these aquatic habitats, and are occasionally encountered in upland habitats. A Sonoran tiger salamander was captured in a pit fall trap at Oak Spring in Copper Canyon, Huachuca Mountains, by Arizona Game and Fish Department personnel (Abbate 1998). The nearest known breeding site is approximately 0.6 mile to the south, suggesting the salamander may have moved at least that far. Capture in a pit fall trap also confirms that the individual was surface active. In other subspecies of *Ambystoma mavortium* and the closely related *A. tigrinum*, metamorphs may disperse hundreds of meters from the breeding pond, or may remain nearby (Petranka 1998, Gehlbach *et al.* 1969). Of hundreds of marked *Ambystoma m. nebulosum* in northern Arizona, two were found to move from 0.9-1.2 miles to new ponds (J. Collins, pers. comm. 1998). On Fort Huachuca, Sheridan Stone (pers. comm. 1998) reported finding terrestrial tiger salamanders (probably *A. m. mavortium*) 1.9-2.5 miles from the nearest known breeding pond. Referring to conservation of the California tiger salamander, *A. californiense*, Petranka (1998) finds that based on studies of movements of other *Ambystoma* species, conservation of a 650-1,650 foot radius of natural vegetation around a breeding pond would protect the habitat of most of the adult terrestrial population. Adults of *A. mavortium* subspecies typically live in or about mammal burrows (Petranka 1998), although metamorphs may construct their own burrows, as well (Gruberg and Stirling 1972, Semlitsch 1983). Some species of salamanders exhibit seasonal migrations of up to several miles each way from breeding sites to upland habitats (Stebbins and Cohen 1995). If such migrations occur in the Sonoran tiger salamander, we have no information about migration corridors or non-breeding habitat.

Because of the arid nature of the environments in the region where the subspecies occurs, if salamanders move very far from breeding ponds, they may use wet canyon bottoms as movement corridors.

Primary threats to the salamander include predation by non-native fish and bullfrogs, diseases, catastrophic floods and drought, illegal collecting, introduction of other subspecies of salamanders that could genetically swamp *A. m. stebbinsi* populations, and stochastic extirpations or extinction characteristic of small populations. Predation by catfish, bass, mosquito fish, and sunfish can eliminate stock tank populations of Sonoran tiger salamander (Jonathan Snyder, Arizona State University, pers. comm. 1996; Collins *et al.* 1988). The salamanders can apparently coexist with bullfrogs, but bullfrogs prey on salamanders (J, Snyder, pers. comm. 1996) and perhaps if they are present in sufficient densities could reduce or eliminate salamander populations. Tadpoles of wood frogs (*Lithobates sylvatica*), are known to feed on spotted salamander (*Ambystoma maculatum*) eggs (Petranka *et al.* 1998), but under experimental conditions bullfrog tadpoles do not feed on viable salamander eggs or hatchlings (Collins 1996, J. Collins, pers. comm. 1996). Recent genetic analysis confirmed that barred salamanders (*A. m. mavortium*) or hybrids between barred salamanders and Sonoran tiger salamanders are present at seven stock tanks along Highway 83 and near Parker Canyon Lake in the San Rafael Valley (Ziemba *et al.* 1998, Storfer *et al.* 2004). A salamander population in Garden Canyon, Fort Huachuca, near the crest of the Huachuca Mountains, also contains hybrids. Barred salamanders are likely present due to their use as fish bait in and around Parker Canyon Lake.

Tiger salamander populations in the western United States and Canada, including populations of the Sonoran tiger salamander, exhibit frequent epizootics (Collins *et al.* 2001). Sonoran tiger salamander populations experience frequent disease-related die-offs (approximately eight percent of populations are affected each year) in which almost all salamanders and larvae in the pond die. *Ambystoma tigrinum* virus (ATV) is the pathogen believed to be primarily responsible for these die-offs (Jancovich *et al.* 1997). This, and possibly other iridoviruses, are also apparently the proximate cause of die-offs observed in other *Ambystoma* salamander populations in the United States and Canada (Collins *et al.* 2000, Docherty *et al.* 2003). ATV may be spread by bullfrogs, birds, cattle, or other animals that move among tanks (Jancovich *et al.* 1997); however, the viral life cycle appears to be restricted to tiger salamanders - no other syntopic hosts have been identified (Jancovich *et al.* 2001). In the laboratory, Sonoran tiger salamanders exhibited lower survival and growth rates when exposed to the disease as compared to *Ambystoma mavortium nebulosum* from the White Mountains of Arizona (Collins *et al.* 2003). Animals that survive ATV exposure may harbor transmissable infection for more than six months. Dispersing metamorphosed salamanders have been found carrying ATV, and when they return to a pond to breed, may reinfect the aquatic population (Collins *et al.* 2003). The disease could be spread by researchers or anglers if equipment such as waders, nets, or fishing tackle used at a salamander tank are not allowed to dry or are not disinfected before use at another tank. ATV is an emerging pathogen (Storfer 2003), and genetic analysis suggests a single introduction and recent spread over a large geographic area from Arizona to Saskatchewan (Jancovich *et al.* 2005). ATV may have switched from sport fishes to salamanders or was introduced with water dogs (*A. m. mavortium*) imported for use as fish bait in Arizona and elsewhere (Jancovich *et al.* 2005). Collins *et al.* (2003) identified ATV in waterdogs obtained from a Phoenix bait shop

Some die-offs might occur as a result of low pH (M. Pruss, AGFD, pers. comm.). A copper smelter at Cananea, Sonora, less than 25 miles south of the border, may have released sulfur plumes resulting in acid precipitation (Platz 1993, Blanchard and Stromberg 1987), but currently there is no evidence to connect salamander die-offs with the copper smelter, and the smelter has not operated since 1999.

Sonoran tiger salamanders also contract chytridiomycosis, a fungal disease associated with global declines of frogs and toads (Davidson *et al.* 2003, Speare and Berger 2000, Longcore *et al.* 1999, Berger *et al.* 1998). However, compared to anurans, infected salamanders exhibit only minimal symptoms (Davidson *et al.* 2000). In the laboratory, infected Sonoran tiger salamanders did not die from the disease and are capable of ridding themselves or much reducing chytrid infections by frequent sloughing of the skin (Davidson *et al.* 2003). The effect of the disease on salamander populations needs further study.

With the exception of Bog Hole in the San Rafael Valley, a site on Fort Huachuca, and Rancho Los Fresnos, cattle grazing occurs throughout the range of the Sonoran tiger salamander. Cattle can degrade habitat at stock tank breeding sites and overgrazing can cause loss of cover and erosion that can threaten the integrity of stock tanks used by the salamander. However, the salamander has coexisted for about 250 years with grazing and because of its current use of livestock tanks for breeding, is now dependent upon maintenance of cattle waters by ranchers (U.S. Fish and Wildlife Service 2002).

For further information on the ecology, taxonomy, range, and threats to this subspecies, refer to U.S. Fish and Wildlife Service (2002), Collins (1996, 1981), Collins and Jones (1987), Collins *et al.* (1988, 2003), Crother (2008), Gehlbach (1967), Jancovich *et al.* (1997, 1998, 2005), Jones *et al.* (1995, 1988), Lowe (1954), Snyder *et al.* (1998, 1996), Storfer (2003), and Storfer *et al.* (2004).

Environmental Baseline – Sonoran Tiger Salamander

The project area contains occupied, suitable, and potential habitat for the Sonoran tiger salamander. The action area includes all known sites within the project area as well as downslope/downstream areas within surrounding lands, both public and private, to include Sonoita Creek and the San Rafael Valley.

According to Arizona Game and Fish Department Heritage Program data (which likely do not include all known sites and combines historical sites with occupied sites), there are a total of 51 occupancy records for Sonoran Tiger Salamander within the Huachuca FireScape action area; 42 are on National Forest System (NFS) lands (Table 15, Figure 7 in the BA). Heritage Program records show four tiger salamander sites on non-federal lands. NFS lands contain 82 percent of the known occupied Sonoran tiger salamander sites in its entire range.

Within the past 5 years, five consultations have included analyses that anticipated incidental take of Sonoran tiger salamanders. Our February 11, 2008, Intra-Service biological and conference opinion on issuance of an Enhancement of Survival Permit (TE-083686-0) to the Arizona Game and Fish Department (22410-2003-F-0022) anticipated the harassment, harm, mortality, or injury of up to 15 Sonoran tiger salamanders and their eggs, larvae, and metamorphs annually for the entire project area, which overlaps substantially with the Huachuca FireScape action area. Our

March 2, 1999, biological opinion and March 17, 2005, reinitiation on the Coronado National Forest's Lone Mountain Prescribed Burn (02-21-98-F-0287 and 02-21-05-F-0214, respectively) ultimately anticipated the incidental take of 15 salamanders or eggs each at one or more of the eight occupied stock tanks in or near the project area. Our January 16, 2004, emergency consultation on the Ryan Fire (02-21-02-F-0157) anticipated that 20 Sonoran tiger salamanders had been incidentally taken in association with water drafting during fire suppression actions. In our October 24, 2002, biological opinion on the continuation of livestock grazing on the Coronado National Forest (2-21-98-F-399-R1), we anticipated incidental take by various means, including; (1) capture, holding of, and re-release of salamanders in any occupied stock tank; (2) direct mortality or injury of up to five salamanders due to construction and maintenance of range projects; (3) harm through mortality of up to all salamanders at one tank because of disease transmission or introduction of nonnative organisms by livestock or personnel associated with the livestock grazing program; (4) harm of salamanders through reduced survival or productivity as a result of removal of shoreline or aquatic cover and egg deposition sites, and increased turbidity at five stock tanks; and (5) direct mortality or injury of up to 10 salamanders and 100 eggs annually at each tank grazed by livestock as a result of cattle wading into stock tanks and trampling or ingesting animals. Our June 14, 2007, biological opinion on ongoing operations at Fort Huachuca(22410-2007-F-0132, 2-21-02- F-229, 2-21-98-F-266) anticipated the incidental take of the entire aquatic population at Upper Garden Canyon Pond once during the life of the project.

Effects of the Proposed Action – Sonoran Tiger Salamander

Data are lacking on the effects of fire on salamanders. Prescribed fire could potentially result in direct death or injury of salamanders, and reduced habitat quality or quantity. It is likely that fire has little direct effect on salamanders as adults are rarely active above ground; when they are active, it is usually under cool, moist weather conditions that occur outside the fire season (FWS 1997). During the dry season, salamanders are generally either in burrows, where they are relatively safe from fire, or under moist rotten logs or moist vegetation mats that are not likely to burn except under extreme fire weather conditions; when prescribed fires would not be implemented. Prescribed fire that increases downed woody debris while retaining some overhead shade probably improves habitat structure of salamanders. However, in the short-term fire can be detrimental to plethodontid salamanders by eliminating ground cover and associated invertebrates that are key food sources.

Degradation of watershed condition immediately after fires can result in increased runoff, sedimentation, and debris flow that can scour aquatic habitats in canyon bottoms or bury them in debris (DeBano *et al.* 1998). In degraded watersheds, less precipitation is captured and stored, thus perennial aquatic systems downstream may become ephemeral during dry seasons or drought (Rinne and Neary 1996). Fire could result in degradation of the immediate watershed around a pond, and result in erosion, sedimentation, and ash flow into the pond. Although effects on salamanders are unknown, in salmonid fish, ash and slurry flow into streams can be toxic and populations of macroinvertebrates (salamander prey species) can be drastically reduced after a fire (Rinne and Neary 1996), at least temporarily. Smoke diffusion into water and ash flow can result in high levels of phosphorus and nitrogen (Spencer and Hauer 1991) with unknown effects to salamanders. Siltation of a pond due to erosion and runoff following a fire could eliminate habitat. However, the effects of siltation may also be more subtle. Lefcort *et al.* (1997) examined the effects of silt on growth and metamorphosis of larval mole salamanders, *Ambystoma*

opaceum and *A. tigrinum tigrinum*. Salamanders in silty water grew more slowly, metamorphosed sooner, and were more susceptible to infection by a water mold, *Saprolegnia parasitica*, than salamanders in non-silty water.

Sonoran tiger salamanders are tolerant of a wide range of temperatures, with temperatures in ponds varying from less than 5°C at the beginning of the year up to 30°C during summer. Temperatures in the terrestrial environment range from below freezing to over 35°C. Mammal burrows or loosened soils outside the pond likely provide refugia for metamorphosed salamanders in the terrestrial environment, enabling them to burrow underground to avoid extreme environmental conditions. Adults of western subspecies of A. tigrinum typically live in or about mammal burrows (Petranka 1998), although metamorphs may construct their own burrows, as well.

During fire control activities, water is sometimes extracted from ponds or lakes. Such water transfer could result in spread of disease or non-native species or aquatic salamanders could be scooped out of a tank and dropped on the fire. Conservation measures RAW-10, RAW-11, WFP-19 mandate that no water would be drafted for fire (prescribed fire) control activities from bodies of water known to be occupied by the Sonoran tiger salamander and that no waters would be transferred between sources.

Despite the conservation measures, it is reasonable to assume some amount of acres would be burned due to fire escape. If the fire spreads outside of the primary burn area, fire suppression activities could affect salamanders or their habitat. Frederick (pers. comm. 2009) stated that an up-to 5-acre spill-over of fire would be considered within prescription; anything larger would constitute a wildfire and thus, potentially require reinitiation of formal consultation.

Establishment of fire crew camps, equipment staging areas, and landing strips; use of off-road vehicles, particularly tracked vehicles; and creation of fire lines during prescribed fire or fire suppression could all result in direct mortality of terrestrial Sonoran tiger salamanders. Salamanders could be killed if active on the surface or may be crushed in shallow burrows, or they could be harmed if habitat was degraded. Routes created or enhanced during fire suppression activities could facilitate public access to breeding sites. Increased recreational use of breeding sites could result in introduction of nonnative fish or bullfrogs by anglers, and collection and relocation of salamanders. Relocation of aquatic organisms could also facilitate spread of the iridiovirus that regularly decimates aquatic populations of salamanders. The disease could also be spread by anglers via waders, tackle or other equipment used at a pond where the disease is present and then using that same wet or muddy equipment at another occupied tank. Off-road vehicle enthusiasts also enjoy the challenge of driving through or on the edge of stock tanks, which may result in disease transmission, crushing of salamanders or eggs, and increased turbidity with associated effects discussed above and by Lefcort *et al.* (1997). If Petranka's (1998) estimate of a 650 to 1,650 foot radius around breeding sites is accurate as the area where most terrestrial tiger salamanders occur, then Conservation Measure WFP-19, which limits project-related activities within 1,650 feet of occupied stock tanks, would limit take of Sonoran tiger salamanders. Conservation measure RAW-7 (crossings for motorized vehicles across a perennial stream would not be permitted, unless an established road already exists or where dry, intermittent sections occur) and RAW-9 (placement of prescribed fire support sites (e.g., camps, staging areas and, refueling sites) would be outside riparian areas or river/stream corridors) would also limit incidental mortality of salamanders.

If aquatic populations of salamanders are eliminated due to disease, ash flow, increased turbidity, or collection, but the habitat remains suitable (i.e., the tank is not silted in or erodes away, and fish are not introduced), the tank is likely to be recolonized by terrestrial salamanders. As a result, effects of the action that result in destruction of breeding sites or introduction of nonnative predators are much more serious to the viability of the species than death or injury of individuals. Maximum manageable areas (Conservation Measure WFP-4) have been designed to protect salamanders from increased sedimentation and ash from the proposed activity by avoiding treatment in riparian areas, providing site-appropriate buffers and minimizing the amount and intensity of treatment in individual watersheds at a given time.

Cumulative Effects

The most critical habitat requirement of the Sonoran tiger salamander is the availability of standing water (FWS 1997). Human development that further reduces standing water or prevents the standing water from developing, will further impact the species. Catastrophic risk reduction efforts on non-Federal land, continued urbanization and other developments that effect water quality and quantity are expected to impact the species. Future State or private activities, not involving Federal activities, which do or could occur within the action area are numerous and include development of private property, road and utility maintenance, and grazing, primarily within the San Rafael Valley and on private lands within and adjacent to the Coronado National Forest. Subdivision of parcels, housing construction, and mining operations are part of the development of private property. These habitat changes are beyond the administrative jurisdiction of the Forest Service – Coronado National Forest, Dept. of Defense - Fort Huachuca, and National Park Service - Coronado National Memorial.

Conclusion – Sonoran tiger Salamander

After reviewing the current status of the Sonoran tiger salamander, the environmental baseline for the action area, the effects of the proposed Huachuca FireScape action, and the cumulative effects, it is the FWS's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the Sonoran tiger salamander. We present this conclusion for the following reasons:

- Prescribed fire and treatment activities could result in incidental mortality of terrestrial salamanders.
- Treatment activities could produce ash deposition and sediment deposition in occupied habitat.
- Conservation measures include area-wide maximum manageable areas (MMAs) that direct the action agencies to avoid riparian areas, limit the amount and timing of treatment within the watershed, and develop site-appropriate buffers will greatly reduce the amount of sediment/ash produced and introduced to salamander habitat. Such measures will avoid or greatly minimize the cumulative effects of treating multiple areas within the same watershed.
- The spatial distribution and contiguous size of planned burn/treatment areas would be considered in order to reduce the effects of peak flow change on stream channels.

- Best management practices identified within the Forest Service Handbook offer a variety of mechanisms that will be used to further control sediment and ash production/movement to minimize more local effects to the species.
- Yearly monitoring will guide project implementation to ensure significant impacts to the species or at a watershed scale do not occur.
- The proposed action is designed to reduce the risk of catastrophic wildfire. Catastrophic wildfire is expected to have considerably greater impacts to the species than the proposed action.
- Critical habitat has not been designated for the Sonoran tiger salamander thus, none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined (50 CFR §17.3) to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. "Harass" is defined (50 CFR §17.3) as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the action agencies (Coronado National Forest, Coronado National Memorial, and/or Fort Huachuca, as applicable) so that they become binding conditions of any grant or permit issued by the action agencies, as appropriate, for the exemption in section 7(o)(2) to apply. The aforementioned action agencies have a continuing duty to regulate the activity covered by this incidental take statement. If the action agencies: (1) fail to assume and implement the terms and conditions; or (2) fail to require applicants to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to any permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Coronado National Forest (or Coronado National Memorial or Fort Huachuca, as applicable) must report the progress of the action and its impact on the species to the FWS as specified in the incidental take statement. [50 CFR §402.14(i)(3)].

Amount or Extent of Incidental Take – Mexican Spotted Owl

Current section 7 consultation guidance provides for incidental take if an activity compromises the integrity of a PAC. Actions outside PACs will generally not be considered to result in incidental take of owls, except in cases when areas that may support owls have not been

adequately surveyed and we are reasonably certain incidental take could occur. This policy was defined in a July 1, 1996, FWS memo titled “Conducting Section 7 Consultation on Mexican Spotted Owls and Critical Habitat – Policy” and is supported by the information compiled in the Recovery Plan (FWS 1995) and supporting material.

We do not anticipate that the proposed action will compromise the integrity of any of the 11 non-wilderness, non-Fort Huachuca PACs in the action area and thus, no incidental take is anticipated.

Amount or Extent of Take – Sonoran tiger Salamander

Take of Sonoran tiger salamanders could occur in the form of harm, harassment, injury, or death resulting from prescribed fire, escaped prescribed fire, contamination of aquatic sites with ash, loss of aquatic sites due to sedimentation, crushing of occupied burrows, vehicle strikes of terrestrial individuals, loss of downed wood and other terrestrial refugia, introduction and spread of diseases, facilitation of increased access for collection and/or introduction of nonnative salamanders and other harmful aquatic species. Implementation of the proposed conservation measures will minimize the potential for these events to occur, but the probability cannot be eliminated.

We anticipate that incidental take of Sonoran tiger salamander will be difficult to detect for the following reasons: the species is small in size and cryptic, remaining hidden within aquatic sites, subterranean burrows, and in moist refugia (e.g. downed logs) for much of its life; finding a dead or impaired specimen is unlikely; losses may be masked by seasonal fluctuations in numbers or other causes (e.g., oxygen depletions for aquatic species). We have determined that occupied Sonoran tiger salamander sites are an appropriate surrogate measure to quantify incidental take. As such, we anticipate that implementation of the proposed action will result in the: (1) harm, harassment, and/or death of an indeterminate number of Sonoran tiger salamanders at one (1) occupied aquatic site during each implementation year of the Huachuca FireScape Project, for a total of ten (10) such impacts between 2009 and 2019; and (2) the loss, such as by complete sedimentation, of three (3) occupied aquatic sites during implementation of the Huachuca FireScape Project between 2009 and 2019.

Effect of the Take – Sonoran tiger Salamander

In this biological opinion, we have determined that this level of anticipated take is not likely to result in jeopardy to the species for the reasons stated in the Conclusions section, above.

Reasonable and Prudent Measures – Sonoran tiger Salamander

The following reasonable and prudent measures are necessary and appropriate to minimize take of Sonoran tiger salamander:

1. The Coronado National Forest (or Coronado National Memorial or Fort Huachuca, as applicable) shall monitor incidental take resulting from the proposed action and report to the FWS the findings of that monitoring.

2. The Coronado National Forest (or Coronado National Memorial or Fort Huachuca, as applicable) shall minimize the transmission of pathogens and nonnative species between Sonoran tiger salamander sites.

Terms and Conditions – Sonoran Tiger Salamander

In order to be exempt from the prohibitions of section 9 of the Act, the Coronado National Forest (or Coronado National Memorial or Fort Huachuca, as applicable) must comply with the following term(s) and condition(s), which implement the reasonable and prudent measure(s) described above and outline required reporting/monitoring requirements. This/these term(s) and condition(s) is/are non-discretionary.

The following Terms and Conditions implements Reasonable and Prudent Measure 1 for Sonoran tiger salamander:

1.1 Monitoring of incidental take shall include not only observations of mortality or harm of Sonoran tiger salamander, but also reports of instances where: (a) water has been taken from occupied aquatic sites in association with (prescribed) fire suppression; (b) appreciable ash flows have entered occupied aquatic sites; and (c) instances where riparian vegetation surrounding/buffering occupied aquatic sites has been affected by prescribed fire or mechanical treatments. This monitoring shall be incorporated into the annual monitoring reports already submitted to the FWS, and may include photographic documentation for Item C. The duration of this monitoring shall be one (1) year post burn. Occupancy of sites will be determined by the action agencies.

1.2 Monitoring of incidental take of Sonoran tiger salamander shall include observations of instances where an occupied aquatic site has been lost, such as by having been completely filled by sediment. In this circumstance, the action agencies shall remove the sediment and restore the site to open water within three (3) years.

The following Terms and Condition implements Reasonable and Prudent Measure 2:

2.1 In instances where water has been removed from an aquatic site and the site is to be refilled, the replacement water must be obtained from a well site in order to prevent the introduction of diseases and/or nonnative species. Under no circumstances shall replacement water be obtained from other aquatic sites (i.e. open water such as tanks, streams, or reservoirs).

Disposition of Dead or Injured Listed Species

Upon locating a dead, injured, or sick listed species, initial notification must be made to our Law Enforcement Office, 2450 West Broadway Road, Suite 113, Mesa, Arizona 85202 (telephone: 480/967-7900) within three working days of its finding. Written notification must be made within five calendar days and include the date, time, and location of the animal, a photograph if possible, and any other pertinent information. The notification shall be sent to the Law Enforcement Office with a copy to this office.

Care must be taken in handling sick or injured animals to ensure effective treatment and care, and in handling dead specimens to preserve the biological material in the best possible state.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

Mexican Spotted Owl and Sonoran tiger Salamander

- We recommend that the Coronado National Forest, Coronado National Memorial, and Fort Huachuca continue to implement the species' respective recovery plans

In order for the FWS to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the FWS requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation

The FWS appreciates the Coronado National Forest, Coronado National Memorial, and Fort Huachuca's efforts to identify and minimize effects to listed species from this project. For further information please contact Jason Douglas at (520) 670-6150, (x226), or Sherry Barrett at extension (x223). Please refer to the consultation number, 22410-F-2008-0474 in future correspondence concerning this project.

Sincerely,

/ s / Scott Richardson for
Steven L. Spangle
Field Supervisor

cc : Assistant Field Supervisor, U.S. Fish and Wildlife Service, Tucson, Arizona
Senior Fish and Wildlife Biologist, U.S. Fish and Wildlife Service, Flagstaff, Arizona
District Ranger, Sierra Vista Ranger District, Hereford, Arizona
Superintendent, Coronado National Memorial, Hereford, Arizona
Chief, Environment and Natural Resource Division, Fort Huachuca, Arizona

Chief, Habitat Branch, Arizona Game and Fish Department, Phoenix, Arizona
Regional Supervisor, Region V, Arizona Game and Fish Department, Tucson, Arizona

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Appendix A: Concurrences

This appendix contains background information and our concurrence with your determination that the proposed Huachuca FireScape project may affect, but is not likely to adversely affect, the endangered jaguar (*Panthera onca*), the endangered lesser long-nosed bat (*Leptonycteris curasoae*), the threatened Chiricahua leopard frog (*Lithobates chiricahuensis*), the endangered Gila chub (*Gila intermedia*), the endangered Gila topminnow (*Poeciliopsis occidentalis occidentalis*), the endangered Huachuca water umbel (*Lilaeopsis schaffneriana* var. *recurva*), the endangered Canelo Hills ladies' tresses (*Spiranthes delitescens*), and the endangered Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*)

Jaguar

The jaguar was listed as endangered in the United States on March 28, 1972 (37 FR 6176) without critical habitat. Non-United States populations were also listed as endangered at the same time. The listing was extended on July 22, 1997 (62 FR 39147-39157). A detailed account of the taxonomy, biology, and reproductive characteristics of the jaguar is found in the Final Rule listing the jaguar as an endangered species (62 FR 39147) and in the Jaguar Conservation Assessment and Framework for Arizona, New Mexico, and Northern Mexico (Arizona Game and Fish Department and New Mexico Department of Game and Fish 2007).

Status of Jaguar in the Action Area

Recent sightings of jaguars in the United States may represent dispersing transients on sporadic forays from Mexico into Arizona, Texas, and New Mexico (FWS 2007). However, recent research suggests that jaguars occur in Arizona frequently, continuously, and year-round (McCain and Childs 2008). Jaguars in Arizona and New Mexico, currently and perhaps historically, are likely neither dispersing transients from Mexico nor members of a distinct United States population (McCain and Childs 2008). Regular or intermittent use of the borderlands area by wide-ranging males and no recent indication of the presence of females or cubs, indicates that the United States does not support a separate breeding population (FWS 2007a). Jaguars in the United States and those recently documented in northeastern Sonora, Mexico, likely represent small segments of a large but widely distributed, low-density population at the northern extreme of the species range (McCain and Childs 2008). There have been no confirmed records of jaguars in the project area since 1971; however, recent records (spring 2008) exist for the species just south of the San Raphael Valley in Mexico (personal communication, McCain 2008).

Effects of the Action to the Jaguar

Because potential habitat exists in the project area (e.g., Patagonia/Santa Rita Mountain complex (McCain and Childs 2008)), there is a possibility that an individual could occur within the action area during the time period the Huachuca FireScape project would be implemented. Should a jaguar be present, the proposed treatments may disturb individuals but would not likely result in direct mortality of individuals due to their high level of mobility and large home range size. Because resident, reproducing jaguars are not considered to occur in the United States the proposed activities would not result in a change in the number of jaguars in the United States, nor would the proposed actions cause a change in the reproductive status of the species. The

main effects to the jaguar would be indirect and would stem from modification of habitat and the habitat of its prey species.

No standing deciduous riparian trees in the riparian areas (i.e., EU-1 and EU-13) that jaguars may use as travel corridors would be modified (Table 4), however, areas of dense vegetation within the remainder of the EUs would be thinned, reducing habitat suitability for foraging and hiding cover. Jaguar prey species such as white-tailed deer and javelina would benefit from proposed treatments.

Although habitat in the action area would be modified, the travel corridors would remain largely unaltered, allowing for dispersal into the United States from Mexico. The action area encompasses NFS, DOD, and NPS lands and comprises less than 10 percent of NFS lands within the current range of the species. This, combined with the ranging nature of the species, would not result in a change in the jaguar's distribution.

Conclusion - Jaguar

After reviewing the current status of the jaguar, the environmental baseline for the action area, and the effects of the action, we concur with your determination that the proposed action is not likely to adversely affect the species for the following reasons:

- the jaguar is a wide-ranging species and although travel corridors may be thinned, treatments are not expected to prevent jaguars from using the travel corridors or entering the United States;
- treatments will benefit the main prey species of jaguars (e.g., deer and javelina)(see Design Feature WFP-12); and
- critical habitat has not been designated for the jaguar; none would be affected.

Lesser Long-nosed Bat

The greatest densities of lesser long-nosed bats are located in northern Mexico and in southern Arizona (FWS 1994). Known major roost sites include 16 large roosts in Arizona and Mexico. According to surveys conducted in 1992 and 1993, the number of bats estimated to occupy these sites was greater than 200,000. Twelve major maternity roost sites are known from Arizona and Mexico. According to the same surveys, the maternity roosts are occupied by over 150,000 lesser long-nosed bats. The numbers above indicate that although a relatively large number of these bats are known to exist, the relative number of known large roosts is small. Disturbance of these roosts and the food plants associated with them could lead to the loss of the roosts. Limited numbers of maternity roosts may be the critical factor in the survival of this species.

Status of Lesser Long-nosed Bat in the Action Area

Records of the lesser long-nosed bat within the action area and within foraging distance (≈ 40 miles) include at least two large post-maternity roosts; observers have recorded over 15,000 lesser long-nosed bats at State of Texas Mine in the Coronado National Memorial and over 30,000 bats at Patagonia Cave (McIntire 2006 in DoD 2006).

Other records include:

(1) Panama Mine near Pyeatt Ranch on the western boundary of Fort Huachuca;
(2) Pyeatt Cave, Fort Huachuca;
(3) Manila Mine, Fort Huachuca;
(4) Woodcutters Canyon, Fort Huachuca;
(5) Wren Bridge, Fort Huachuca;
(6) Brown Canyon, Huachuca Mountains;
(7) Canelo Mine, Huachuca Mountains;
(8) Miller Canyon, Huachuca Mountains;
(9) SPRNCA at Fairbank;
(10) Ramsey Canyon, Huachuca Mountains;
(11) State of Texas Mine, Coronado National Memorial, Huachuca Mountains;
(12) Cave of the Bells, Santa Rita Mountains;
(13) Helvetia, Santa Rita Mountains;
(14) Madera Canyon, Santa Rita Mountains;
(15) Empire Ranch north of Sonoita;
(16) several localities near Patagonia; and
(17) Colossal Cave, Pima County.

Of the above sites, FWS (1994) considered the Patagonia Bat Cave, Manila Mine, State of Texas Mine, and the Cave of Bells to be major post-maternity roosts of the lesser long-nosed bat. Three major maternity roosts and five major post-maternity roosts are known in Arizona. Post-maternity roosts are typically transitory roosts used by adults and/or young bats in summer or fall (FWS 1994).

The action area is located within a portion of this species' range utilized as a migratory corridor during the southward seasonal movement. Semidesert grasslands and lower oak woodlands provide summer and early fall foraging habitat of paniculate agave. There are no records of parturient or lactating lesser long-nosed bats from the area. Rather, occurrence coincides with post-maternity dispersal of juveniles and adult females. Howell (1996 in U.S. Department of Defense 2006) suggests there are many potential roost sites in the Huachuca Mountains where hundreds of nectar feeding bats could roost without being detected.

Lesser long-nosed bats require suitable forage plants. At and near the action area, forage plants include Palmers agave and possibly Parry's agave (the two are known to hybridize, as well.) Several areas of agave stands on Fort Huachuca are protected and are known as agave management areas. These stands have relatively high densities of agave as compared with other populations across the action area.

Effects of the Action to Lesser Long-nosed Bat

Mechanical treatment and prescribed burning would not affect roosting long-nosed bats as these bats roost in caves, mines, and old buildings. Fire and other vegetation management activities would not be located within 0.5 mile of occupied caves and abandoned mines. Since bats forage at night, proposed treatments would not cause direct disturbance to foraging bats. However, treatments could be applied on approximately 230,000 acres of foraging habitat (see Table 6 in

the BA) which represents 68 percent of the potentially suitable habitat within the project area. However, treatments would be implemented over the course of approximately 10 years, thereby spreading out the impacts over time. Foraging bats may be indirectly disturbed by prescribed fire and mechanical treatment when these activities damage agave. Due to the mobility of the species, the disturbances are expected to be limited. The effects of fire on Palmer's Agave are not fully understood; in one study, fire did not appreciably decrease food resources of the lesser long-nosed bat or the reproductive resources and survivorship of *A. palmeri*" (Slauson 2002). Impacts to agave from fire were monitored in the 2000 and 2005 Lone Mountain prescribed burns. Agaves were burned in both fires; however, direct mortality from fire was less than 5 percent (monitoring report on file at the Sierra Vista Ranger District).

Conclusion - Lesser Long-nosed Bat

After reviewing the current status of the lesser long-nosed bat, the environmental baseline for the action area, and the effects of the action, we concur with your determination that the proposed action is not likely to adversely affect the species for the following reasons:

- treatments would be planned to minimize adverse effects to lesser long-nosed bat forage plants and roosts (see Design Features WFP-15 and 16);
- treatments would reduce the density of encroaching shrubs and trees; and
- treatments will reduce the potential for major wildfires in lesser long-nosed bat foraging and roosting habitat.

This analysis addresses effects to listed species at the most intensive treatment level - the potential maximum acres that could be treated over the estimated 10-year implementation period (270,000 acres – see Table 4). This analysis is conducted as if treatments will occur at the most intensive level allowed by the prescriptions while implementing all required minimization measures. Treatment effects will likely be less than that expected under the maximum potential treatment scenario because:

- site-specific treatments will be designed for each project within the overall Huachuca FireScape project area;
- resource advisors will coordinate site-specific burn and implementation plans with the U.S. Fish and Wildlife Service and Arizona Game and Fish Department to identify site-specific measures to protect federally listed and sensitive species, and species of concern;
- maximum manageable areas (MMAs) would be delineated to avoid impacts to sensitive areas; and
- critical habitat has not been designated for the lesser long-nosed bat; none would be affected.

Chiricahua Leopard Frog

The Chiricahua leopard frog was listed as a threatened species on June 13, 2002 (67 FR 40789). In 2004, genetic analysis was used by Goldberg, Field and Sredl (2004) to investigate the phylogenetic relationship of *Lithobates (Rana) subaquavocalis* and *Lithobates (Rana) chiricahuensis* from localities throughout their Arizona range. The results are consistent with the hypothesis that *chiricahuensis* and *subaquavocalis* are conspecific (NatureServe 2006). A nuclear DNA study is under way at the University of Arizona to determine the taxonomic

placement of the northern population of *R.. chiricahuensis* (to elevate to separate species or not), and to definitively determine if *R. subaquavocalis* is conspecific with *R. chiricahuensis* (Arizona Game and Fish Department 2006). The U.S. Fish and Wildlife Service Draft Recovery Plan (2007) for the Chiricahua leopard frog treats the Ramsey Canyon leopard frog (*Lithobates (Rana) subaquavocalis*) as *Lithobates (Rana) chiricahuensis* because it is likely to be recognized as such in the near future.

A detailed account of the taxonomy, biology, and reproductive characteristics of the Chiricahua leopard frog is found in the Final Rule listing the Chiricahua leopard frog as a threatened species (67 FR 40790, June 13, 2002) and the Chiricahua Leopard Frog (*Lithobates chiricahuensis*) Recovery Plan (FWS 2007).

Status of Chiricahua Leopard Frog in the Action Area

Lithobates (Rana) chiricahuensis is an inhabitant of Cienégas, pools, livestock tanks, lakes, reservoirs, streams, and rivers at elevations of 3,281 to 8,890 feet in central and southeastern Arizona, including Santa Cruz and Cochise counties. In Arizona, slightly more than half of all known historical localities are natural lotic systems, a little less than half are stock tanks, and the remainder are lakes and reservoirs (Sredl *et al.* 1997).The species has been extirpated from about 75 percent of its historic localities in Arizona and New Mexico. In southeastern Arizona, no recent records exist for the following mountain ranges or valleys: Pinaleño Mountains, Peloncillo Mountains, Sulphur Springs Valley, and Huachuca Mountains (FWS 2002).

Ramsey Canyon leopard frog *(Lithobates (Rana) subaquavocalis)* is only found on the east side of the Huachuca Mountains in Cochise County, Arizona. Its current range is limited to aquatic habitats on the east flank of the Huachuca Mountains and in backyard ponds in the city of Sierra Vista. In the Huachuca Mountains, Ramsey Canyon leopard frog can be found from 4,750 feet (1,448 m) in Carr Canyon to 6,400 feet (1,951 m) in Miller Canyon. They are also found at a refugia pond east of the Huachuca Mountains at 4,570 feet (1,393 m; Arizona Game and Fish Department 2006). There is speculation that the historical range (Ramsey Canyon leopard frog) may have included the San Pedro River Valley and parts of Chihuahua, Mexico (Platz 1997). Unconfirmed Ramsey Canyon leopard frog historical records for the Huachuca Mountains include Ash, Bear, Carr, Copper, Garden, Hunter, Miller, Montezuma, Parker, Scotia, and Sunnyside canyons (Arizona Game and Fish Department 2006). There are no recent records from these sites. Goldberg *et al.* (2004) reports that Ramsey Canyon leopard frog is currently found in five canyons on the east side of the Huachuca Mountains, due to intensive conservation actions and translocation efforts. Populations appear to be declining and recruitment is low at all known localities. Frogs released in Miller Canyon in 1999 produced at least 28 egg masses in 2000 and the population appeared to be doing well. At two sites, Tinker Pond and Ramsey Canyon, chytrid fungus has been found in dead frogs. This fungus has been implicated in the declines of amphibians around the world (Berger *et al.* 1998) and may play a role in the decline of *R. subaquavocalis*. According to NatureServe (2006), “one known breeding site in recent years; probably fewer than 100 breeding adults; threats include non-native aquatic animals, disease, and drought…”

A survey of frogs at two stock ponds in Brown Canyon on Forest Service land in June 2008 reported 175 Ramsey Canyon leopard frogs and two egg masses. Similarly high numbers of Ramsey Canyon leopard frog have been reported from Miller Canyon, including numerous egg

masses. Ramsey Canyon leopard frog is reproducing at artificial ponds on The Nature Conservancy's Ramsey Canyon Preserve (Matt Killeen, pers. comm.). A population established in an artificial pond at the Carr Canyon administrative site experienced die offs in 2004 and again in 2007. In June 2008, 25 juvenile Ramsey Canyon leopard frogs were reported at the site and no egg masses. Chytrid positive frogs were found at Carr Canyon Administrative Site and Brown Canyon in 2008.

The Chiricahua Leopard Frog (*Rana chiricahuensis*) Recovery Plan (FWS 2007) designated eight recovery units (RUs). To meet the recovery goal of delisting, the frog must reach a population level within each RU and have sufficient habitat distributed throughout its historical range to provide for the long-term persistence of metapopulations. Threats that led to the listing of the frog must be reduced or eliminated to maintain or increase population levels and protect habitat.

The action area lies within Recovery Unit 2: Santa Rita-Huachuca-Ajos/Bavispe. The following description of RU2 is excerpted from the Chiricahua Leopard Frog (*Rana chiricahuensis*) Recovery Plan (FWS 2007):

> *"RU 2 includes the headwaters of the San Pedro and Santa Cruz rivers and adjacent mountain ranges in Arizona and Sonora. Southern and western ranges in Sonora also drain into the Rio Sonora, Bavispe, and Magdalena. Vegetation communities range from Chihuahuan Desert scrub along the San Pedro River to mixed conifer and aspen at the highest elevations. Chiricahua leopard frogs are still relatively well represented in RU 2. These extant populations are the foundations for seven MAs, which also include adjacent habitats where metapopulations could be built or expanded upon…. Extant populations occur in the Santa Rita and Patagonia mountains, El Bosque Nacional y Refugio de Vida Silvestre Los Ajos- Bavispe (Ajos-Bavispe area), Canelo Hills, San Rafael Valley, Cienéga Creek, and upper San Pedro River basin in Sonora. Populations of the Ramsey Canyon leopard frog, tentatively considered as the Chiricahua leopard frog (FWS 2007), also occur on the eastern slope of the Huachuca Mountains.*
>
> *Predation by and spread of non-native predators appear to be the most significant threats to Chiricahua leopard frogs in RU. Chytridiomycosis is present at several sites and has likely affected persistence of populations. Populations testing positive for the disease have persisted at Cienéga Creek, but Ramsey canyon leopard frogs have been eliminated from Ramsey Canyon. The majority of the key habitats for the frog are managed by the Coronado National Forest and are thus afforded some protection, but development pressures elsewhere, particularly in the upper San Pedro River basin of Arizona and Sonora, have and are expected to continue to result in habitat loss and degradation.*
>
> *Wildfire and subsequent downstream ash flow, siltation, and scouring are significant threats, particularly in the Huachuca and Santa Rita mountains. Airborne emissions from copper smelters, and most recently from the smelter at Cananea, likely caused contaminants problems and acidic waters in the past that may have limited opportunities for recovery. The Cananea smelter is now closed; however, if it reopened, effects could remanifest.*

Fuels management and wildfire suppression will be important in ameliorating the threat of wildfire. Planning is underway in the Huachuca Mountains to address this threat, and should be expanded to the Santa Rita Mountains. Control or elimination of non-native predators may be possible on a small scale, and public education, improved policies and regulations, and law enforcement can help stem the spread of non-native predators. Currently, our best opportunities to manage this threat are by finding sites in which frogs can be repatriated where non-natives are absent or manageable. Similarly, finding habitats for recovery where amphibian chytrids are absent or frogs can coexist with chytrids is currently the best scenario for dealing with the threat of disease. Research into control of non-natives and amphibian chytrids may expand opportunities for recovery."

For the purposes of determining effects to the species, the Guidance Criteria (USDA Forest Service 2002) define habitat for the species as follows:

Suitable Chiricahua leopard frog habitat includes lakes, rivers, streams, springs, ponds, and man-made structures such as reservoirs, stock tanks, and acequias. The frog uses permanent or nearly permanent pools and ponds for breeding. Sites that support populations of this frog will hold water yearlong in most years. The species is rarely found in aquatic sites inhabited by non-native fish, bullfrogs, or crayfish. Although the project area encompasses numerous watersheds (see Table 11 in the BA) suitable habitats are limited.

Potential habitats are those aquatic systems (within the historic range of the frog) that are damaged or degraded from natural perturbations or chronic stressors (such as improper livestock grazing) but have appropriate hydrological and ecological components capable of being restored to suitable habitat.

Occupied habitat includes sites where the frog is known to occur or where it was present within the last 10 years, but no follow-up surveys have been conducted confirming its absence and suitable habitat is present.

Likely to be occupied habitat includes: 1) currently suitable habitat where the frog has been documented within the last 10 years, but is apparently now absent or 2) suitable habitat that is (a) within 1 mile overland of occupied habitat, (b) within 3 miles along an ephemeral or intermittent drainage from occupied habitat, or (c) within 5 miles along a perennial stream from occupied habitat. The species was last found in the project area in the Canelo Hills and east side of the Patagonia Mountains as recent as 2000. Although no Chiricahua leopard frogs have been found at these sites since, they constitute likely to be occupied habitat.

Effects of the Action to Chiricahua Leopard Frog

There would be no treatment of riparian vegetation in or in adjacent buffers to suitable, potential, occupied or likely to be occupied Chiricahua leopard frog habitat at any time of the year (specifically excluded from treatment are EU-1: Low gradient riparian systems and EU-13: Sensitive higher gradient streams (line segments) nested within EUs 5, 10, 11 and 12 (23 miles) and outside appropriately sized buffers adjacent to perennial streams and ponds).

Since larval and adult Chiricahua leopard frogs occur in stock tanks, ponds, and streams, mechanical treatment and prescribed burning will have no direct effects to leopard frog eggs, larvae, or adults. Instead, all effects would be indirect and would result from soil or ash inflow into occupied waters. An inflow of ash and sediment into a water body is capable of smothering eggs and tadpoles thus resulting in a change in the number of individuals. Soils of the project area vary in erosion hazard potential. Although best management practices and conservation measures would prevent significant increases, some erosion and possibly sedimentation could occur (see Figure 6 in the BA).

Sediment and ash inflow can also inhibit respiration in macroinvertebrates resulting in reduced density and composition of macroinvertebrates. In one study, a 7- to 10- fold decrease in macroinvertebrate density and a 25 to 75 percent drop in diversity was observed after a major runoff event (Rinne and Neary 1996). A reduction in the amount of prey species can ultimately affect leopard frog numbers and reproduction.

Introduction and spread of disease is of increasing concern. The spread of disease through human activities can occur through vehicles, people, and/or equipment working or traveling through an infected area and then going to an uninfected area as discussed in the status of the species. Bullfrogs are known carriers of the chytrid fungus *Batrachochytrium dendrobatidis* as are Mountain treefrogs (*Hyla eximia*).

The extent to which the proposed action may affect the species is related, in part, to the number of acres treated upstream and the distance of the projects to suitable habitat. For example, the Forest Service Handbook on best management practices (USDA Forest Service 1980) recognizes that flow increases are not significant until about 25 percent of the basal area of a forested watershed is cut. Incorporation of conservation measures in prescribed burn plans has been successful in minimizing effects to streams in the Huachuca Mountains.

Conclusion - Chiricahua Leopard Frog Text

After reviewing the current status of the Chiricahua leopard frog, the environmental baseline for the action area, and the effects of the action, we concur with your determination that the proposed action is not likely to adversely affect the species for the following reasons:

- treatment activities could produce insignificant amounts of ash deposition and sediment deposition in potential, suitable, or occupied habitat;
- conservation measures in area-wide maximum manageable areas (MMAs) such as avoiding riparian areas, limiting the amount and timing of treatment with the watershed, and developing site-appropriate buffers will greatly reduce the amount of sediment/ash produced and introduced to frog habitat. Such measures will avoid or greatly minimize the cumulative effects of treating multiple areas within the same watershed;
- the spatial distribution and contiguous size of planned burn/treatment areas would be considered in order to reduce the effects of peak flow change on stream channels;
- best management practices identified within the Forest Service Handbook offer a variety of mechanisms that will be used to further control sediment and ash reduction/movement to minimize more local effects to the species;
- monitoring will guide implementation to ensure significant impacts to the species or at a watershed scale do not occur;

- the proposed action is designed to reduce the risk of catastrophic wildfire. Catastrophic wildfire is expected to have considerably greater impacts to the species than the proposed action;
- Design Feature WFP-18 will be implemented to avoid and minimize effects to the species; and
- critical habitat has not been designated for the Chiricahua leopard frog; none would be affected.

Gila Chub

The Gila chub was listed as an endangered species on November 2, 2005 (70 FR 66664). Gila chub commonly inhabit pools in smaller streams, Cienégas, and artificial impoundments ranging in elevation from 2,000 to 3,500 feet. Gila chub are highly secretive, preferring quiet deeper waters, especially pools, or remaining near cover including terrestrial vegetation, boulders, and fallen logs. Adults are often found in deep pools and eddies below areas with swift currents. Young-of-the-year inhabit shallow water among plants or debris, while older juveniles use higher velocity stream areas. The historic range of the chub likely included suitable habitat throughout the entire Gila River basin, except the Salt River drainage above Roosevelt Lake. While the Gila chub has been recorded in approximately 30 rivers, streams, and spring-fed tributaries throughout the Gila River basin in southeastern Arizona, only 29 populations of Gila chub remain; all but one are small, isolated, and threatened.

Status of Gila Chub in the Action Area

Loss or degradation of habitat (dewatering and changes in stream morphology and substrate) are the chief explanations for the decline of these fish. Non-native species, particularly green sunfish (*Lepomis cyanellis*—predators) and crayfish (*Oronectes virilis*—competitors) are also significant threats to the Gila chub. Sunfish were first observed in O'Donnell Creek in the Canelo Hills (within the action area) in 1990. The Nature Conservancy (TNC) began planning a creek restoration project in 1998 after data for the 1994-1997 period indicated sharp declines in chub numbers and reproduction and increases in sunfish. In 2002, TNC, USDA Forest Service, and Arizona Game and Fish Department removed native fish, applied piscicide to the stream to eliminate non-native species, and then replaced the natives. The success of this project been limited; follow-up surveys have found only small numbers of native fish, while green sunfish and crayfish persist.

On November 2, 2005, the U.S. Fish and Wildlife Service established critical habitat for the Gila chub in seven Arizona watersheds. Certain stream segments of the Babocomari River Area Critical Habitat (Area 3) are within the Huachuca FireScape action.

Area 3: Babocomari River Area (FWS 2005):

> This area lies in Santa Cruz County, Arizona. Historically the Babocomari River was a perennial stream which flowed through Cienégas and marshlands all the way to the San Pedro River. However, livestock overgrazing destroyed much of the river. In 1995, AGFD found that the only water use was a large impoundment in the river, on the Babocomari Ranch. Perennial flows begin upstream from this impoundment near T–4 Spring. Gila chub were first collected from the Babocomari River in 1892 near Fort Huachuca Military

Reservation and again in 1950, approximately 3.5 mi below the Babocomari Ranch (Weedman *et al.* 1996). Tributaries to this area include O'Donnell Canyon and Turkey Creek, which are designated as critical habitat. Threats to this critical habitat area requiring special management and protections include fire, grazing, and nonnative species.

a. O'Donnell Canyon—10.0 km (6.2 mi) of creek extending from its confluence with Turkey Creek upstream to the confluences of Western, Middle, and Pauline Canyons. O'Donnell Canyon provides the full range of primary constituent elements necessary for the conservation of the Gila chub. AGFD surveyed O'Donnell Creek and found Gila chub in O'Donnell Creek, although at very low numbers, in 2004 (Dean Foster, AGFD, in litt. 2005). Land ownership is BLM, Coronado National Forest, and private.

b. Turkey Creek—6.3 km (3.9 mi) of creek extending from its confluence with O'Donnell Canyon upstream to where Turkey Creek crosses AZ Highway 83. Turkey Creek contains one or more of the primary constituent elements, including perennial pools, the necessary vegetation that provides cover, and adequate water quality. Gila chub have not been detected in Turkey Creek since 1991, although in wet years this segment is connected to occupied habitat in O'Donnell Creek (Weedman *et al.* 1996). Land ownership is Corona National Forest and private lands.

c. Post Canyon (includes NFS lands upstream from the O'Donnell Creek confluence).

Effects of the Action to Gila Chub

Direct effects to Gila chub habitat and/or chubs from the implementation of the proposed action would be avoided with MMAs such that no cutting or burning of riparian vegetation, no motorized equipment in or adjacent to the creek, no development of skid trails or roads across or adjacent to the creek, and/or no construction of firelines that tie into the creeks would occur.

The species is subject to numerous indirect effects of fire, both prescribed and wild. Increased soil erosion as a result of fire may result in amplified stream channelization and sedimentation, which may alter the species' habitat (85 to 90 percent of the Gila chub's habitat has been degraded or destroyed, and much of it is unrecoverable). However, there would be no treatment of riparian vegetation in or adjacent to occupied Gila chub habitat at any time of the year (specifically excluded from treatment are EU-1: low gradient riparian systems and EU-13: sensitive higher gradient streams (line segments) nested within EUs 5, 10, 11 and 12 (23 miles) and outside appropriately sized buffers adjacent to perennial streams and ponds). The scale of impacts (i.e., the proportion of a watershed with occupied or unoccupied suitable habitat that would be subject to treatment) would be kept at insignificant levels by considering the spatial distribution and contiguous size of planned burn/treatment areas.

Indirect effects to the chub and its habitat from the implementation of mechanical and/or burning treatments could include a modification of flows, increases in sedimentation, increases in nutrients, and the addition of ash into the creek. The subsequent introduction of ash from prescribed burning poses the biggest threat to Gila chub. Propst (1999) reports that ash flows from wildfires in the Mimbres watershed diminished Chihuahua chub (*G. nigrescens*) populations. However, the amount of runoff and sediment and ash deposition resulting from

implementation of the Huachuca FireScape is expected to be insignificant. Area-wide conservation measures such as avoiding riparian areas, limiting the amount and timing of treatment with the watershed, and developing site-appropriate buffers will greatly reduce the amount of sediment/ash produced and introduced to chub habitat.

With the implementation of the conservation measures, adverse effects to Gila chub would be reduced by minimizing the number of acres treated at a time and ensuring site- appropriate buffers that reduce ash and sediment inflow.

Conclusion - Gila Chub

After reviewing the current status of the Gila chub, the environmental baseline for the action area, and the effects of the action, we concur with your determination that the proposed action is not likely to adversely affect the species for the following reasons:

- although treatment activities could produce some ash deposition and sediment deposition in occupied habitat; there is a low likelihood some individuals will be impaired or die as a result;
- Area-wide Maximum Manageable Area (MMA) guidelines such as avoiding riparian areas, limiting the amount and timing of treatment with the watershed, and developing site-appropriate buffers will greatly reduce the amount of sediment/ash produced and introduced to Gila chub habitat. Such measures will avoid or greatly minimize the cumulative effects of treating multiple areas within the same watershed;
- the spatial distribution and contiguous size of planned burn/treatment areas would be considered in order to reduce the effects of peak flow change on stream channels;
- best management practices identified within the Forest Service Handbook offer a variety of mechanisms that will be used to further control sediment and ash production and movement to minimize more local effects to the species;
- monitoring by the Forest Service will guide implementation to ensure significant impacts to the species or at a watershed scale do not occur;
- the proposed action is designed to reduce the risk of catastrophic wildfire. Catastrophic wildfire is expected to have considerably greater impacts to the species than the proposed action;
- Design Feature WFP-21 will be implemented to avoid and minimize effects to the species; and
- critical habitat will be affected but the Minimization Measures/Design Features described above and in BA Appendix C will reduce the magnitude of those effects such that critical habitat is not adversely modified or destroyed, nor will it be affected to the extent that recovery is precluded.

Gila Topminnow

Gila topminnow was listed as endangered in 1967 without critical habitat. Only Gila topminnow populations in the United States, and not in Mexico, are listed under the Act. The reasons for decline of this fish include past dewatering of rivers, springs and marshlands, impoundment, channelization, diversion, regulation of flow, land management practices that promote erosion and arroyo formation, and the introduction of predacious and competing nonnative fishes.

Status of Gila Topminnow in the Action Area

Rangewide status and distribution information appears in our June 13, 2008, biological opinion on the proposed Redrock Canyon fish barrier and native fish restorations, and is incorporated herein via reference. Natural Gila topminnow populations are extant in the Santa Cruz River near Lochiel and downstream of the Nogales International Wastewater Plant, and in Sonoita and Cienéga creeks (Voeltz and Bettaso 2003). Gila topminnow also presently occur in the Redrock Canyon drainage. Each of these streams are located downstream of areas to be subject to the proposed action.

Effects of the Action to Gila Topminnow

The species is subject to numerous direct or indirect effects of fire, both prescribed and wild (Gresswell 1999). The cause of direct fire-related fish mortalities has not been clearly established (ibid.). Fatalities are most likely during intense fire in small, headwater streams with low flows (less insulation and less water for dilution). In these situations, water temperatures can become elevated or changes in pH may cause immediate death (Cushing and Olson 1963). However, no riparian habitat would be subject to prescription burning so no direct mortality is expected. Indirect effects of prescribed fire and vegetation treatments could include ash and/or debris flows, increased water temperature, nutrient inputs, and sedimentation (Swanston 1991, Bozek and Young 1994, Gresswell 1999). Increased soil erosion as a result of prescribed fire and vegetation treatments may result in amplified stream channelization and sedimentation, which may alter the species habitat. Although much of the Sonoita Creek Watershed is classified as having a potential for significant effects (see Figure 9 in the BA), conservation measures would minimize the potential for such effects.

Conclusion – Gila Topminnow

After reviewing the current status of the Gila topminnow, the environmental baseline for the action area, and the effects of the action, we concur with your determination that the proposed action is not likely to adversely affect the species for the following reasons:

- although treatment activities could produce some ash deposition and sediment deposition in occupied habitat, there is a low likelihood individuals would be impaired or die as a result;
- Area-wide Maximum Manageable areas (MMA) guidelines such as avoiding riparian areas, limiting the amount and timing of treatment with the watershed, and developing site-appropriate buffers would greatly reduce the amount of sediment/ash produced and introduced to Gila topminnow habitat. Such measures would avoid or greatly minimize the cumulative effects of treating multiple areas within the same watershed;
- the spatial distribution and contiguous size of planned burn/treatment areas would be considered in order to reduce the effects of peak flow change on stream channels. The proportion of a watershed with occupied habitat or suitable unoccupied habitat would have insignificant indirect effects;
- best management practices identified within the Forest Service Handbook offer a variety of mechanisms that would be used to further control sediment and ash production and movement to minimize more local effects to the species;

- monitoring would guide implementation to ensure significant impacts to the species or at a watershed scale do not occur;
- the proposed action is designed to reduce the risk of catastrophic wildfire. Catastrophic wildfire is expected to have considerably greater impacts to the species than the proposed action;
- Design Feature WFP-20 will be implemented to avoid and minimize effects to the species; and
- critical habitat has not been designated for the Gila topminnow; none would be affected.

Huachuca Water Umbel

The Huachuca water umbel is found in mostly small ciénegas and stream segments in five major watersheds - San Pedro River, Santa Cruz River, and the ríos Yaqui, Sonora, and Magdalena. All sites are 3,500 to 6,500 ft. in elevation. The expansion and contraction of Huachuca water umbel populations appear to depend on the presence of refugia where the species can escape the effects of scouring floods, a watershed that has an unaltered hydrograph, and a healthy riparian community that stabilizes the channel.

Status of Huachuca Water Umbel in the Action Area

Huachuca water umbel occurs in several streams and Cienégas throughout the action area, including Sonoita Creek, Scotia Canyon, Cienéga Creek, Garden Canyon, and the San Pedro River (Gori *et al.* 1990, Falk and Warren 1994, Engineering and Environmental Consultants, Inc. 2004).

Limited numbers of populations and the small size of populations make the Huachuca water umbel vulnerable to extinction as a result of stochastic events that are often exacerbated by habitat disturbance. Populations are in most cases isolated, as well, which makes the chance of natural recolonization after extirpation less likely. Small populations are also subject to demographic and genetic stochasticity, which increases the probability of population extirpation (Shafer 1990, Wilcox and Murphy 1985).

Figure 10 in the BA delineates Huachuca water umbel critical habitat within the FireScape perimeter on the Coronado National Forest. Downstream areas, which are within the action area, include 1.25 mile of Sonoita Creek, 2.7 miles of the Santa Cruz River, and 33.7 miles of the upper San Pedro River.

Effects of the Action to Huachuca Water Umbel

No riparian areas within the action area would be included within a prescribed burned or otherwise treated (i.e., mechanical or hand treatments). Riparian buffers within suitable, occupied, or critical habitat would be used to protect all populations from scouring floods. Therefore, the proposed treatments are not expected to directly affect the Huachuca water umbel or adversely modify designated critical habitat. However, experience has shown that even a controlled burn can intrude into buffer zones, although the extent of burning has always been minor and of low intensity.

All riparian areas within the action area, whether intermittent or perennial, require design of an adequate buffer. Riparian buffers would minimize potential increases in peak flows and sediment (if there are any), and stay within levels the riparian vegetation can withstand. Thinning treatments in adjacent non-riparian vegetation would not increase peak flows high enough for the water umbel to be removed by scouring. Riparian buffer widths would be variable depending on anticipated treatment effect and site-specific resource concerns.

Conservation measures would prevent impacts from vehicular access and treatment-associated activities. The buffer requirement would constrain treatment types and intensities allowed in the prescriptions. Monitoring data from projects with similar treatments (i.e., the Lone Mountain prescribed burn) have shown that buffers around ponds, springs, and canyon bottoms were generally effective in protecting Huachuca water umbel populations and associated critical habitat (FWS 2005: concurrence letter in response to reinitiation of the Biological Opinion for the Lone Mountain Prescribed Burn, March 17, 2005). There may be areas where, because of needed treatment, either in intensity, type or size, topography, substrate, proximity to water umbel, or some other factor, riparian areas cannot be buffered well enough to prevent scouring of either the water umbel or its critical habitat. These areas cannot be treated without further consultation.

The steadily increasing risk of catastrophic, stand-replacing fires with subsequent increases in runoff and erosion is a threat to the umbel and its critical habitat. While catastrophic fires increase peak flows, they can also degrade a watershed's ability to hold water resulting in lower base flows. Perennial aquatic systems may become ephemeral during dry seasons or drought. The conditions could result in decline or extirpation of some water umbel populations. Thinning in the project areas is designed to decrease the risk of catastrophic wildfires. Reduced densities of the targeted woody species should have some unquantifiable positive effect on stream flow. Even minor increases in stream base flows could have significant beneficial effect.

Conclusion – Huachuca Water Umbel

After reviewing the current status of the Huachuca water umbel, the environmental baseline for the action area, and the effects of the action, we concur with your determination that the proposed action is not likely to adversely affect the species or its critical habitat for the following reasons:

- the proposed treatments are not expected to directly affect the Huachuca water umbel;
- the proposed treatments are likely to reduce the risk of increased stream flows caused by catastrophic wildfire that would degrade or remove water umbel habitat;
- Area-wide Maximum Manageable Area (MMA) guidelines such as avoiding riparian areas, limiting the amount and timing of treatment with the watershed, and developing site-appropriate buffers will greatly reduce the amount of sediment/ash produced and introduced to salamander habitat. Such measures will avoid or greatly minimize the cumulative effects of treating multiple areas within the same watershed;
- the spatial distribution and contiguous size of planned burn/treatment areas would be considered in order to reduce the effects of peak flow change on stream channels;
- best management practices identified within the Forest Service Handbook offer a variety of mechanisms that will be used to further control sediment and ash production and movement to minimize more local effects to the species;

- monitoring will guide Forest Service implementation to ensure significant impacts to the species or at a watershed scale do not occur;
- Design Features WFP-3 and 13 will be implemented to avoid and minimize effects to the species; and
- critical habitat will be affected but the Minimization Measures/Design Features described above and in BA Appendix C will reduce the magnitude of those effects such that critical habitat is not adversely modified or destroyed, nor will it be affected to the extent that recovery is precluded.

Canelo Hills Ladies' Tresses

The Canelo Hills ladies tresses was listed as an endangered species on January 6, 1997 (62 FR 665). Populations of this orchid can be found in scattered locations in the upper Babocomari and Santa Cruz River watersheds. This orchid is known from five sites in Cienéga Creek and streamside habitats within the San Pedro River watershed in Santa Cruz and Cochise counties, Arizona. These sites occur in habitats where scouring floods are unlikely. Soils supporting the populations are finely grained, highly organic, and seasonally or perennially saturated. Springs are the primary water source, but a creek near one locality contributes near-surface groundwater.

Status of Canelo Hills Ladies' Tresses in the Action Area

The five sites for this orchid occupy less than 200 acres of habitat near the U.S./Mexico border. Four sites occur on private land. The fifth site, on lands within the National Forest System, consists of a few plants below a site on a larger portion of suitable habitat along O'Donnell Creek. The cryptic nature of this plant, except when flowering, together with its ability to persist below ground in some years, make surveys and prediction of plant numbers difficult. Primary potential threats to this species include a number of activities that result in wetland habitat degradation such as groundwater overdrafts, surface water diversions, impoundments, channelization, improper livestock grazing, agriculture, mining, invasive exotic species, and recreation. This orchid is also potentially threatened by collection. The limited distribution and low numbers of individuals of this species leave it vulnerable to extinction from stochastic events.

In the early 1990s, The Nature Conservancy suspected that an accumulation of dried vegetation in orchid habitat at the Canelo Hills Cienéga was inhibiting emergence and sexual reproduction. TNC staff set up plots and experimentally burned them in 1991, 1993, and 1996 based on the McClaran and Sundt (1992) study and anecdotal observations indicating a population decline. Monitoring between 1994 and 1999 showed orchid declines on unburned plots while numbers on the burned plots increased independently of precipitation. In addition, the season of the burn and years since the previous burn were also noted as significant. These limited results suggest that cool season burns increase the number of Canelo ladies tresses while hot season burns decrease the population size. Nonetheless, further studies are necessary to confirm the suitability of cool season prescribed fires.

Effects of the Action to Canelo Hills Ladies' Tresses

No riparian areas would be prescribed burned or otherwise treated (i.e., mechanical or hand treatments). Riparian buffers within suitable, occupied, or potentially occupied habitat would be

used to protect all populations. Therefore, the proposed treatments are not expected to directly affect the Canelo Hills ladies tresses or adversely affect habitat. Thinning that provides even a modicum of increased surface or subsurface flows to O'Donnell Creek would be beneficial to the Canelo Hills ladies tresses.

Conclusion - Canelo Hills Ladies' Tresses

After reviewing the current status of the Canelo Hills ladies' tresses, the environmental baseline for the action area, and the effects of the action, we concur with your determination that the proposed action is not likely to adversely affect the for the following reasons:

- reducing the threat of catastrophic wildfire that could depopulate an entire site and potentially increasing water flow via thinning may benefit the species;
- the Forest Service will survey and protect riparian areas that may contain the species with a site-appropriate buffer. This buffer will protect plants from adverse effects including scouring floods;
- the proposed action is designed to reduce the risk of catastrophic wildfire. Catastrophic wildfire is expected to have considerably greater impacts to the species than the proposed action;
- Design Feature WFP-3 will be implemented to avoid and minimize effects to the species; and
- critical habitat has not been designated for Canelo Hills ladies' tresses; none would be affected.

Pima Pineapple Cactus

The Pima pineapple cactus was listed as an endangered species on September 23, 1993 (58 FR 49875 49880). This cactus grows in alluvial basins or on hillsides in semi-desert grassland and Sonoran desert scrub. Soils range from shallow to deep, and silty to rocky, with a preference for silty to gravely deep alluvial soils. The plant occurs most commonly in open areas on flat ridge tops or areas with less than 10-15% slope. Habitats for the Pima pineapple cactus can be broken into two major divisions: ridges in what is now or once was grassland, and alluvial fans in Sonoran desert scrub. On a smaller scale, the species occupies habitats that are relatively flat and sparsely vegetated. Populations of Pima pineapple cactus are found from 2,300 to 4,500 feet elevation in Pima and Santa Cruz counties, Arizona and northern Sonora, Mexico. The range extends east from the Baboquivari Mountains to the western foothills of the Santa Rita Mountains. The northernmost boundary is near Tucson. Potential habitat for this species is difficult to estimate due to its habitat requirements and the topographic complexity within its range. Populations tend to be patchy, widely dispersed, and highly variable in density. In addition, associated habitat types are not uniformly distributed throughout the plant's range.

Status of Pima Pineapple Cactus in the Action Area

The cactus is found at the western edge of the Huachuca FireScape project. The approximately 60 Pima pineapple cacti known from the Coronado National Forest comprise a small portion of known numbers. Surveys indicate the entire amount of suitable habitat on the Forest is approximately 2,600 acres scattered in isolated pockets.

Effects of the Action to Pima Pineapple Cactus

Conservation measures would safeguard against significant adverse effects should treatment areas contain suitable/occupied habitat. All persons working in potential habitat would be trained to identify Pima pineapple cactus and its habitat. Should sites be encountered during treatment, where suitable habitat parameters are met for the cactus, that is, areas below 4,200 feet on open ridgetops of rolling hills with slopes less than 10 percent where soils are deep and well-drained, surveys would be conducted before slash is lopped and scattered or piled onto the open area. Because surveys may not detect all Pima pineapple cactus there would be some chance an individual could be burned.

Thinning treatments are focused on reducing fuel loads and canopy covers of stands currently far denser than overstory densities tolerated by Pima pineapple cactus. Should thinning take place adjacent or near occupied habitat, treatments could potentially provide habitat for the spread of the species. However, the likelihood of this beneficial effect is extremely remote. At a landscape scale, treatments would reduce the risk of high-intensity wildfires.

Conclusion – Pima Pineapple Cactus

After reviewing the current status of the Pima pineapple cactus, the environmental baseline for the action area, and the effects of the action, we concur with your determination that the proposed action is not likely to adversely affect the species for the following reasons:

- the Forest Service would survey treatment areas with suitable habitat and protect all documented plants from moving vehicles and slash deposition;
- a blackline/mineral soil ring would encircle each known plant with a site-appropriate buffer to avoid impacts from broadcast burning;
- in suitable habitat for Pima pineapple cactus, no broadcast burning would be conducted where Lehmann’s lovegrass is the primary grass component;
- the proposed action is designed to reduce the risk of catastrophic wildfire. Catastrophic wildfire is expected to have considerably greater impacts to the species than the proposed action;
- Design Features WFP-3 and 14 will be implemented to avoid and minimize effects to the species; and
- critical habitat has not been designated for Pima pineapple cactus; none would be affected.