United States Department of the Interior

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In Reply Refer To:
AESO/SE
22410-2003-F-0485

November 10, 2009

Memorandum

To: Superintendent, Grand Canyon National Park, Grand Canyon, Arizona

From: Field Supervisor

Subject: Biological Opinion for the Grand Canyon National Park Fire Management Plan

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 May 27, 2009, and received by us on May 29, 2009. At issue are impacts that may result from the proposed Grand Canyon National Park Fire Management Plan (FMP) located in Coconino County, Arizona. The proposed action may affect the California condor (*Gymnogyps californianus*) and the Mexican spotted owl (MSO) (*Strix occidentalis lucida*) and its critical habitat.

In your memorandum, you requested our concurrence that the proposed action is not likely to adversely affect the sentry milk vetch (*Astragalus cremnophylax* var. *cremnophylax*). We concur with your determination and our rationale is in Appendix A.

Your memorandum stated that you also determined that the proposed action will not affect brown pelican (*Pelecanus occidentalis californicus*), southwestern willow flycatcher (*Empidonax traillii extimus*), Yuma clapper rail (*Rallus longirostris yumanensis*), desert tortoise (*Gopherus agassizii*), humpback chub (*Gila cypha*) and critical habitat, razorback sucker (*Xyrauchen texanus*) and critical habitat, Kanab ambersnail (*Oxyloma haydeni kanabensis*), yellow-billed cuckoo (*Coccyzus americanus*), and relict leopard frog (*Lithobates {=Rana} onca*). Although several of these species were included in previous programmatic fire-management consultations (Arizona Ecological Services Office [AESO] file numbers 02-21-02-F-0118 and 02-21-03-F-0232), you stated in a July 16, 2009, memorandum that if suppression actions occur in the future near any of these species habitats, you would request emergency consultation at that time. Consequently, you did not request consultation on effects from fire suppression activities included in the proposed action on any listed species except California condor, MSO and its critical habitat, and sentry milk-vetch. Species with "no effect" determinations do not require review from the FWS, and are not addressed further.

The bald eagle (*Haliaeetus leucocephalus*), although no longer listed under the Act within the project area, is protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668–668d) (Eagle Act). In a memorandum dated July 16, 2009, you stated that no fire management activities would be conducted during the winter when bald eagles are present along the Colorado River corridor, and that your proposed action would not affect the bald eagle. However, golden eagles (*Aquila chrysaetos*) are also protected under the Eagle Act and nest in the Grand Canyon. On September 11, 2009, FWS published final permit regulations to authorize limited take of bald and golden eagles under the Eagle Act, which will become effective on November 10, 2009. We recommend that you review your proposed action to determine if take of golden eagles, as defined by the Eagle Act, may occur, and if so, work with us to implement conservation measures to avoid such take or determine whether an Eagle Act permit is necessary.

This biological opinion is based on information provided in the May 2009 biological assessment (BA) (GRCA 2009a), the draft and final environmental impact statements (EIS), meetings, telephone conversations, field investigations, and other sources of information. Literature cited in this biological opinion is not a complete bibliography of all literature available on the species of concern, fire management and its effects, or on other subjects considered in this opinion. A complete administrative record of this consultation is on file at this office.

Consultation History

Table 1 is a summary of the consultation history for the proposed project.

Table 1. Consultation history for the Grand Canyon National Park Fire Management Plan.

Date	*Event*
March 2006	We attended initial presentation and meeting of Enterprise Team.
June 18, 2007	We met with Grand Canyon National Park (GRCA) staff to develop conservation measures for the proposed action.
October 1, 2007	We met with GRCA staff to discuss conservation measures.
June 25, 2008	We provided comments on the proposed action to GRCA.
September 28, 2008	We received a draft biological assessment.
October 7, 2008	We provided comments on the draft BA.
October 22, 2008	We met with GRCA staff to discuss effects of the proposed action on listed species.
December 17, 2008	We conducted a conference call to discuss effects of the proposed action on listed species.
January 13, 2009	We provided comments on a draft EIS.
March 11, 2009	We met with GRCA to discuss status of modifications to the proposed action.
March 23, 2009	We met with GRCA to discuss measures that could reduce the impacts of the proposed action on listed species.
April 6, 2009	We received a summary of previous discussions with GRCA.
April 22, 2009	We met to determine any remaining issues that needed to be addressed in the BA prior to your submitting it for formal consultation.

May 29, 2009	We received a request for formal consultation.
July and August 2009	We met with GRCA to discuss information necessary for the formal consultation.
August 24 and 28, 2009	We received additional information from GRCA regarding the formal consultation.
October 15, 2009	We provided a draft biological opinion to GRCA.
November 5, 2009	GRCA provided comments on the draft biological opinion.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

Most of the information regarding the proposed action in this document is from the BA, which is incorporated herein by reference.

The term of the proposed action is indeterminate and is based on a specific number of acres to be treated rather than a set timeframe. As a result of the proposed action, up to 64,200 acres of prescribed fire, 55,000 acres of wildland fire-use, and 20,050 acres of wildfire and suppression could occur within Grand Canyon National Park (GRCA). We anticipate that full implementation of the project will occur over the next 10 to 15 years.

The FMP will implement Alternative 2 of the FMP EIS. The FMP will largely continue the current GRCA fire-management program. New elements include the development of new fire management units (FMUs), an updated adaptive-management process, and a site-specific prescribed fire-treatment schedule. The FMP includes wildfire, use of fire-suppression tactics, wildland fire-use strategies, prescribed fire, and manual fuel-reduction treatments, and will add mechanical fuel-reduction treatments. The FMP incorporates:

- Mechanical treatments at strategic locations (such as Highway 67), given constraints of wilderness.

- Prescribed burns at strategic locations.

- Allowance for wildland fire-use if a fire looks as though it will achieve resource benefits, such as enhancement of wildlife habitat, reduction of tree densities, reduction of total fuel loads, and increasing aspen abundance.

- Use of suppression actions to minimize fire intensity when there is a potential for a large amount of high and moderate-high fire severity effects.

Key elements of the proposed action include the following:

- All human-caused fires will be managed using current National Park Service policy.

- Collaboration with neighboring agencies and private land owners will remain an important element in fire management program success.

- Non-fire fuel treatments may occur in proposed wilderness to protect values at risk.

- Thinning and reduction of dead-and-down fuels and some live fuels may occur on prescribed fire unit boundaries to reduce risk of high-intensity fire along those boundaries.

- Thinning and reduction of dead-and-down fuels and some live fuels along roads, trails, and fire line may occur during wildland fire-use fire management.

- South Rim prescribed fires may be implemented any month of the year. North Rim prescribed fires will not likely occur in December, January, and February.

- Managing fires for resource benefit will not be conducted in the two wildland-urban interface (WUI) FMUs.

- Mechanical and manual thinning associated with Highways 64 and 67 road corridors (300 feet from road centerline) will be designated WUI projects.

- Up to 80 percent of proposed thinning projects will be conducted using contracted services.

- Moderate-high and high severity fire in the mixed-conifer cover type will be allowed if all interrelated factors have been assessed. Specifically, GRCA will:

    - Assess the amount of moderate-high and high severity fire through composite burn index (CBI) monitoring after each managed fire in the mixed-conifer vegetation type above the rim.

    - Use the adaptive management process to adjust prescribed burn prescription, ignition pattern, burn seasonality, and/or pre-treatment to ensure that no more than 30 percent of the mixed-conifer vegetation type and MSO mixed-conifer restricted habitat burns with moderate-high and high severity. This includes high and moderate-high fire severity from past fires (2000 to present) and all fires that will occur within the scope of the FMP. The allowance of 30 percent high and moderate-high fire severity is not meant to be a target but is a maximum amount.

- The annual and cumulative areas burned with high and moderate-high severity fire will be included in the annual reports and discussed during annual meetings with the FWS. The adaptive management process will be used during the planning, implementation, and review process for each fire event with the intent that more tools can be developed to continue to minimize high and moderate-high fire severity effects.

- The FMP will coordinate protection of natural resources potentially affected by fire management activities through a program that includes annual surveys or inventories, a potential effects assessment, and mitigation measures developed to minimize adverse effects to site-specific resources.

- Wildlife biologists will conduct appropriate review and survey of project areas and work in conjunction with fire managers to develop burn plans to meet specific objectives while minimizing effects to resources in a project area. Site-specific measures may include such activities as coordinating timing of burns to minimize breeding bird impacts from smoke or noise and constructing control lines around such sites.

- GRCA fire managers will conduct an annual Minimum Requirement Analysis to address strategic and tactical options for prescribed fire, fire effects monitoring, and wildland fire-use activities in wilderness. The annual assessments will define the minimum activity necessary to conduct an operation with hand tools or some combination of hand and motorized equipment including aircraft.

- Maps identifying sensitive wilderness resources will be updated annually prior to the fire season. The maps will be used by Resource Advisors during wildland fire incidents for a variety of purposes including identifying areas where retardant should not be used, locating sensitive plant and animal populations, and identifying where camps or helispots should be located.

Table 2. Summary of components of the FMP that are anticipated or could be allowed in FMUs.

Fire Management Units	*Wildland Fire-Use*	*Prescribed Fire*	*Wildfire and Suppression*	*Manual and Mechanical Treatments*
Kaibab Summit	X	X	X	Manual
Plateau	X	X	X	Manual
Peninsulas	X	X	X	Manual
Fire Islands	X	X (prescribed fires may be applied if wildfires are suppressed)	X	
Backcountry Uplands	X	X	X	Manual
WUI Developed Areas		X	X	X
Secondary WUI		X	X	Manual
Inner Canyon	X		X	

Fire severity data in forest fuels and habitat types similar to the mixed-conifer in GRCA is available from the 2006 Warm Fire, which began as a wildland fire-use event on the Kaibab National Forest. These data indicate that future fires could burn more than 50 percent of an area at high and moderate-high severity. The fire severity data for past fires at GRCA in the mixed-conifer cover type indicate that approximately 24 percent of the fire area burned with high and moderate-high severity effects. The baseline fire modeling data show that even under 80 percentile weather conditions, there is potential for more than 30 percent of the untreated mixed-conifer forest to burn with passive or active crown fires. The FMP will use suppression actions to minimize fire intensity when there is a potential for a large amount of high and moderate-high fire severity effects.

Prescribed Fire

Prescribed fires are management-ignited fires that are managed to meet specific resource objectives. Prescribed fire is applied in strategic locations called burn units and use particular techniques intended to achieve specific results. Techniques are documented beforehand in a burn plan with specific direction as to how the burning will be conducted. The prescriptions that define and influence the results of a particular burn plan include variables such as air temperature, fuels moisture, weather patterns, and the fire behavior expected from those conditions. Fires are ignited only when the predetermined and approved conditions are met. In some instances, a portion of the burn unit may be treated with manual and mechanical removal of some fuels prior to burning to enhance the desired effects of a planned burn. Depending on the fuels conditions and management objectives, prescribed burn units may require multiple burns to meet protection and resource objectives.

Under the proposed action, prescribed fire is planned on a long-term treatment schedule. An average of 5,840 acres will be treated annually through the year 2017. Prescribed fire project areas include one to several burn units that range in size from 167 acres to approximately 20,100 acres. The larger project areas will be subdivided into smaller burn units that will be more manageable for initial burn entries. Burn units range in size from 167 acres to 3,200 acres.

Individual treatment plans are developed to provide detail on treatment techniques (ignition patterns, non-burning measures), treatment prescription (e.g. fuel moisture, wind speed and direction, fire behavior), treatment timing (seasonality, time of day), preservation techniques (lining roost trees, wrapping combustible resources), and treatment monitoring. All treatment plans are reviewed by a GRCA interdisciplinary team prior to implementation.

GRCA uses a variety of tools during planned fires to reduce impacts to resources. Tools that have been used and/or will be considered include:

- Build objectives into treatment plans to minimize moderate-high and high severity fire effects.
- Develop prescriptions that can meet burn objectives and reduce the amount of crown fire.
- Develop firing patterns that use topographic opportunities for backing fire. Use spot ignition to minimize strip head (fires running rapidly up canyons) fires.
- Ignite burns at night or on cloudy days.
- Burn under current and forecasted good and excellent ventilation conditions.
- Use the Emission Reduction Techniques and Smoke Management Techniques provided by Arizona Department of Environmental Quality.

- Develop a burn plan for each broadcast burn unit to avoid lumping multiple burn units into one plan.

GRCA's burn plans will include the following key components to minimize the acreage of high severity fire effects:

- Develop prescriptions and model fire behavior to ensure that the program follows the conservation measures identified in the FMP.

- Develop long-term treatment plans to "burn into the wind" to minimize the occurrence of hotter and less controllable head fire. Fire managers intend to work adjacent to, and upwind of, the past treatment unit in a sequential fashion.

- Develop firing plans that include igniting ridge tops, which allows fire to "back" down slopes and minimize upslope runs.

- Use fewer firing devices during aerial ignition operations to allow the fire to back and flank for extended periods of time in order to reduce the chance of fires coming together all at once.

- Use aerial ignition operations to quickly apply fire to a burn unit when the weather conditions are optimal for meeting objectives.

Some prescribed burn units will require pre-treatment before fire can be applied. Pre-treatment removes small trees, shrubs, and snags prior to the burn to help keep the fire in designated boundaries, to protect specific resources, or to provide more safety for firefighters. Use of manual equipment (including chainsaws) to remove trees and shrubs can increase safety and effectiveness of prescribed burns, especially in and surrounding the WUI FMU. Hand cutting with chainsaws, piling, chipping, lop and scatter, limb removal, pile burning, pile and leave, chip and broadcast, and chip and haul will be considered.

Wildland Fire-Use

Under current NPS policy, naturally-ignited fires are unplanned fires that will be managed with any combination of suppression tactics for protection purposes, management for resource benefits, and/or monitoring strategies. Various portions of a fire could receive different management attention at the same time. The annual acreage managed under wildland fire-use (also described as "managed for resource benefits") will increase. When natural fire ignition occurs in locations or at times when wildland fire-use would not achieve desired conditions, those fires will be suppressed.

Every unplanned ignition will continue to be reviewed for a management response using the Wildland Fire Decision Support System (https://wfdss.usgs.gov/wfdss/WFDSS_About.shtml#o219). The review is an interdisciplinary effort where weather forecasts, fuel moistures, staffing availability, and adjacent fire activity are considered. Decisions to manage a wildland fire for resource benefits are driven by various

factors including expected weather, fuel moisture, and availability of human resources. Acres managed for resource benefits could increase to an annual average of 5,500 acres. The average from 1993 to 2005 was 3,568 acres per year.

GRCA uses a variety of tools during their responses to unplanned fires to reduce impacts to resources. Tools that have been used and will be considered to respond to unplanned fires and minimize negative impacts to resources include:

- Develop management responses to a fire by considering the time of year, location of fire-sensitive natural and cultural sites, past seasonal precipitation amounts and precipitation forecasts, and number and effects of past fire events in and near the fire area.

- Attempt to "steer" the fire into areas that have recent fire histories through the use of additional firing operations and containment and control operations on parts or sections of a fire.

- Prepare tactical areas through fuel-reduction projects like thinning and prescribed fire to create defensible areas to contain a fire's spread or to create anchor points for burnouts and backfires.

Fire Suppression

The proposed action is expected to involve a similar or slightly higher level of fire suppression than occurred in GRCA from 1993 to 2006. All unwanted fires will be suppressed with the use of firefighters, engines, mechanical equipment, and helicopters and/or air tankers. Suppression efforts could occur directly adjacent to the fire (direct attack) or away from the fire edge (indirect attack). Tactical decisions regarding resources or attack methods depends on firefighter and public safety, fire behavior, access, availability of resources, location of natural fire breaks, and location of values at risk.

Ground-related tactics include hand line construction, construction of shaded fuel breaks, construction of safety zones, and mop-up. Backfiring and burnouts, construction of dozer line, and construction of wet line are tactics that may be used on suppression fires. Aerial suppression efforts include dropping water and fire retardant from helicopters and air tankers. Backfiring with helicopters (aerial ignitions) may also be used during indirect attack.

Suppression fires can involve a small group of firefighters on small fires for a few day or shifts, to hundreds or thousands of firefighters on large or complex fires, large mechanical equipment (including bulldozers), and a large aviation force for weeks or months.

Fires that start in forest fuels above the Grand Canyon rims have the potential to go over the rim and continue to burn until they reach natural barriers. Potential for fire spread below the rim exists for both planned and unplanned ignitions. Fire is likely to drop over the rim where continuous fuels are present that will allow fire to move from plateaus into canyons. The amount of fire that will occur below the rim is unknown and dependent on fuels and weather. To mitigate safety concerns and resource damage (such as that caused by fire line construction and

thinning of fuel breaks along the rim edge), GRCA does not try to stop fire from going over the rim of the canyon. When wildland fires drop below the rim, management action points are defined and real-time decisions are made in discussions with Resource Advisors to balance impacts from fire with impacts from suppression efforts. Depending on the situation, a range of fire suppression actions may be taken on fires in the Inner Canyon FMU from, for example, monitoring to helicopter aerial suppression actions. However, according to GRCA, suppression activities in the Inner Canyon are very rare and generally consist of single-tree fires. These fires are generally monitored and go out on their own without firefighter intervention. From 1980 to 2006, there were 262 point fires in the Inner Canyon totaling approximately 1,395 acres. The majority of the acreage burned occurred on six wildfires in the Inner Canyon. Most fires burned less than 0.1 acre.

Manual and Mechanical Treatments

Manual and mechanical techniques are used to accomplish the dual objectives of removing hazardous fuels and protecting values at risk in selected forested areas. Numerous techniques are available to reduce or remove hazardous fuels in forest systems. Such treatments will be used to reduce hazardous fuels, create defensible space, and/or reduce risk of crown fire, and to pre-treat perimeters of prescribed fire and wildland fire-use. In the proposed action, mechanical fuel treatments will only occur in the Primary WUI FMU or directly adjacent to Highway 64 on the South Rim. An estimated 2,500 acres will be treated with mechanical or manual treatments over the timeframe of the proposed action. National Park Service guidance defines manual treatment as "use of hand-operated power tools and hand tools to cut, clear, or prune herbaceous and woody species." Manual fuel removal involves chainsaws, other portable hand-held equipment like gas-powered trimmers, and hand tools.

Mechanical fuel removal may involve wheeled or tracked vehicle use. No new roads will be constructed for any non-fire fuel-treatment project. Mechanical and manual fuel-reduction treatments within the WUI will also be carried out under a long-term treatment schedule resulting in an average of 225 acres treated annually. Thinning standards for WUI under the proposed action are:

- Thin up to a 12-foot canopy clearance, removing trees up to ten inches diameter-at-breast-height (dbh).

- Limb trees four-to-six feet above the ground to reduce ladder fuels.

- Remove up to 60 percent of dead-and-down woody debris 3 to 12 inches dbh and up to 50 percent of dead-and-down woody debris larger than 12 inches dbh.

- Flush-cut all stumps as low to the ground as possible.

- Slash from thinning operations may be removed, lopped, and scattered for a future broadcast burn; piled and burned in place; or chipped on- or off-site.

- Modifications to degree of thinning may occur in the historic landmark district or adjacent to individually listed National Register of Historic Places Buildings.

Higher levels of fuels removal will occur in the immediate vicinity of structures (BA, page 50).

Additional treatment in units not currently identified in the treatment schedule may also be conducted, such as in residential areas and areas greater than 30-feet from structures in order to expand the defensible space.

Monitoring

The primary focus of the GRCA fire monitoring program is assessing the effects of fire or manual/mechanical treatments on vegetation and fuels. However, the program also monitors fire conditions during prescribed fires and wildfires, conducts burn severity assessments under the National Burn Severity Mapping Program, and facilitates the collection of site-specific information used for compliance and consultation requirements. Fire observation monitoring, which includes fire behavior, fire weather, smoke conditions, and resource concerns, occurs during all active fires within the park. Monitoring levels 3 and 4 assess short- and long-term change, respectively, in vegetation structure and composition, fuel load, and other objective-dependent variables.

The GRCA monitoring program design for vegetation and fuels incorporates both landscape- and project-level monitoring. To monitor landscape-level short- and long-term vegetation and fuel changes relating to fire management, GRCA fire management personnel have defined seven monitoring types representing the major vegetation types (piñon-juniper, ponderosa pine, mixed-conifer, and spruce-fir forests and montane grasslands) where prescribed fire has been either used or planned for use as a management tool. Between 1989 and 2008, 146 permanent Fire Monitoring Handbook (FMH) plots were installed in those seven monitoring types. Of those plots, 113 are currently monitored prior to; immediately following; and one, two, five, and ten years following fire activities. For each 20 meter by 50 meter FMH forest plot, information is gathered on overstory trees (diameter and condition), pole-sized trees (diameter, height and condition), seedling trees (height), surface fuels (woody, litter, and duff loadings), herbaceous species (frequency and height), and shrubs (frequency and condition). While the permanent FMH plots were originally designed to monitor prescribed fires, there are instances in which the plots have burned in unplanned events. For example, approximately half of all burned plots on the North Rim have been burned in unplanned events and half in prescribed fires. When this happens, the plots are read and analyzed according to the appropriate monitoring schedule.

Project-level monitoring is a new addition to the GRCA fire monitoring. The primary focus of the project-level Rapid Assessment Protocol (RAP) plots is the mixed-conifer habitat on the North Rim. Prescribed fire units in the mixed-conifer habitat will be monitored on a unit-by-unit basis beginning in the 2010 fire season. In order to assess the effects of prescribed fire on MSO restricted and designated critical habitat, RAP monitoring will include assessments of total basal area, tree canopy cover, large tree density, and tree size class distribution. As with the FMH plots, RAP plots may burn in unplanned events prior to burning in prescribed fire. When this happens, the plots will be read and analyzed according to the appropriate monitoring schedule.

GRCA has conducted burn severity mapping for all prescribed and wildland fires in the park >300 acres in size since 2001. Between 2001 and 2008, 956 CBI-style plots have been installed in the park, providing Normalized Burn Ratio satellite-correlated severity data on 34 fires over approximately 90,000 total acres. A maximum of five burn severity classes are mapped within each prescribed fire and wildfire >300 acres in size. The five burn severity classes distinguish areas of a fire that are unburned and areas that have undergone low, moderate-low, moderate-high, and high levels of ecological change due to fire (Table 3). GRCA conducts burn severity mapping during the first growing season after a fire to allow for a comparison of peak growing season vegetation before and after the fire. The field validation plots include 21 measures of burn severity that are assigned a score between zero (no effect) and three (highest severity). Although some level of recovery of herbaceous and resprouting woody species are likely to have lower CBI scores when measured up to one year post-fire, CBI measures such as delayed mortality due to girdling, presence of new seral species, and changes in species diversity, are likely to have higher scores during the next growing season. GRCA has concluded that Landsat imagery, combined with CBI field validation during the first growing season after fire, provides the most complete picture of the overall ecological changes induced by the fire, and therefore the best assessment of fire severity.

Table 3. Description of burn severity classes.

Burn Severity Class	*Ecological Change*	*Typical Fire Intensity*
Unburned	None	Not applicable
Low	Fire was non-lethal to the dominant vegetation and did not alter the structure of the dominant vegetation. Scattered small, unburned patches intermixed within burn area. Scorching of vegetation generally limited to 1 meter high or less. Small organic material on ground scorched, but not entirely consumed. Most foliage and twigs intact. Mineral soil rarely exposed.	Usually results from low-intensity surface fire; torching is extremely rare.
Moderate-Low	Partial scorching, with minimal consumption, of foliage and fine materials on above ground vegetation. Some green vegetation remains in overstory. Limited overstory tree mortality. Few, if any, unburned patches within the burn area. Most fine organic materials partially consumed, with minimal consumption of large logs. Rotten wood scorched to partially burned. Mineral soil intermittently exposed.	Usually results from low- to moderate-intensity surface fire with isolated single tree torching.
Moderate-High	Considerable scorching, with partial consumption, of foliage and fine materials on aboveground vegetation. Minimal green vegetation remains in overstory. Some overstory tree mortality likely. Consistent patches within burn area have large logs as well as all organic	Usually results from moderate- to high-intensity surface fire with single tree and small-scale group torching.

	materials consumed to bare mineral soil. Most woody debris consumed. Mineral soil generally exposed but intact. May include up to 10% stand-replacing fire with extremely vigorous vegetative regrowth.	
High	Fire killed above ground parts of all vegetation, resulting in stand replacement and changing the forest structure substantially. All foliage and fine materials on vegetation consumed. Most large logs as well as all organic material on the ground consumed. All forest litter and duff consumed, exposing bare mineral soil.	Usually results from crown fire or large-scale group torching.

Adaptive Management

GRCA has included an adaptive management program to plan, implement, evaluate, and modify, if necessary, their fuels management program. GRCA has committed to hold periodic meetings with FWS staff to review FMP activities and discuss whether the FMP is achieving desired conditions for all goals, including management of threatened and endangered species and designated critical habitat. These discussions will also determine whether FMP implementation is within scope of the analysis in the biological opinion.

Elements of the adaptive management strategy include:

- Limiting high and moderate-high severity fire effects in MSO restricted habitat to no more than 30%.
- Improving fire management techniques through experience.
- Making adjustments to techniques and strategies as knowledge improves.
- Using results from vegetation monitoring and research as they become available.

Annual Reports

GRCA has committed to preparing annual reports to document changes to the habitat baseline for listed species through the life of the FMP. The report may also contain information about any species surveys conducted the previous year or other species-specific information. The primary purpose of the annual report is to determine whether the changes in habitat conditions as a result of implementing the FMP are within the expected effects documented in this biological opinion. The report process will also provide some structure to the adaptive management program of the FMP.

The annual report will be prepared jointly by the Fire Management and Resource Management staffs of GRCA beginning the winter of 2009-2010, and each year through the life of the FMP. The report will be delivered to the FWS Flagstaff Ecological Services Suboffice. FWS staff will

be invited to a meeting with GRCA staff to discuss the results and identify if changes may be needed in FMP activities. The report and the discussions will be part of the adaptive management program of the FMP.

Conservation Measures

GRCA will incorporate and implement several measures as part of the proposed FMP to reduce the potential for adverse effects (BA, pages 72, 84, 115).

California Condor

- Cover all water dip tanks when not in use.
- Keep camp areas free of trash.
- Provide all fire personnel literature or instruction regarding condor concerns.
- Record and report immediately any condor presence in the project area to the Resource Advisor or a GRCA wildlife biologist.
- Avoid any condors that arrive at any area of human activity associated with fire management activities. Notify the assigned Resource Advisor or a GRCA wildlife biologist, and only permitted personnel will haze the birds from the area.
- Survey any fire-retardant chemical application areas to the extent possible and remove any contaminated carcasses before they become condor food sources.
- Minimize aircraft use along the rim to the greatest extent possible.
- Keep aircraft at least 1200 feet (400 meters) from condors in the air or on the ground unless safety concerns override this restriction. This restriction does not apply to the North Rim helispot.
- If airborne condors approach aircraft, aircraft will give up airspace to the extent possible, as long as this action does not jeopardize safety.
- Prescribed fire projects will not occur within 0.5 mile of active condor nesting sites.
- If a condor lands at an active manual/mechanical thinning project site, thinning would cease until the condor leaves on its own or until permitted personnel arrive to haze the condor from the area.

Mexican Spotted Owl

- To the maximum extent possible, aircraft will remain at least 1,200 feet (400 meters) from the boundary of any designated Protected Activity Center (PAC).

- Locate areas associated with fire-related activities, such as dip sites or drop points, at least 1,200 feet (400 meters) from the boundary of any designated PAC.

- Survey known PACs that can be surveyed from the rim, and adjacent to prescribed fire or active wildland fire-use areas.

- Survey all MSO habitats within 0.5 mile of project perimeters prior to project implementation in accordance with formal MSO Survey Protocol. GRCA will delay implementation of prescribed burns during the MSO breeding season if MSO are detected during surveys. If a PAC is established, the burn will not take place within the PAC.

- Inform all field personnel who implement any portion of the proposed action about MSO regulations and protective measures. A wildlife biologist will present a program regarding fire management in threatened and endangered species habitat to all personnel involved in the fire-use program.

- Advise the Resource Advisor immediately if a MSO is encountered during any project. The Resource Advisor will maintain a record of MSO encountered during suppression activity and will include location, date, time of observation, and general condition of each owl.

- Coordinate with GRCA wildlife biologists and FWS early in the decision-making process for prescribed, wildland fire-use, and suppression fires.

- Integrate data from reports to FWS on fire activity into the adaptive management program.

Mexican Spotted Owl Critical Habitat

Under the proposed action and as a mitigation measure in the DEIS, GRCA prescribes that a minimum of 70 percent of the mixed-conifer vegetation type within the park will be either unburned or affected by fire classified as low or moderate-low severity, while no more than 30 percent of the mixed-conifer vegetation type within the park will be affected by fire classified as moderate-high or high severity. GRCA has augmented this mitigation measure and has developed a conservation measure specifically designed to protect MSO mixed-conifer restricted habitat and critical habitat.

- Assess the amount of moderate-high and high severity fire through CBI monitoring after each managed fire in the mixed-conifer vegetation type above the rim. Use the adaptive management process to adjust burn prescription, ignition pattern, burn seasonality, and/or pre-treatment to ensure no more than 30 percent of the MSO mixed-conifer restricted habitat burns with moderate-high and high severity. This includes the high and moderate-high fire severity areas from past fires (2000 to present) (BA, Appendix E), and all fires that will occur within the scope of the FMP.

Other conservation measures directed at maintaining MSO critical habitat include:

- Survey all MSO habitat within 0.5 mile of project perimeters prior to project implementation in accordance with formal MSO survey protocol. Adhere to recommendations in the September 2, 1997 FWS memorandum, "Clarification of Recommendations in the Recovery Plan for Mexican Spotted Owl in Regard to Prescribed Natural Fire".

- Ensure all pertinent information from the reasonable and prudent measures from this biological opinion are included in the Wildland Fire Decision Support System for all wildland fire-use actions.

- Document all actions, report any incidental take, and monitor effects of the proposed action on habitat. Report findings to FWS as described in this biological opinion.

Ensure that sufficient monitoring of fire effects on key MSO habitat components is conducted after each wildland fire-use event. Monitoring may require additional plots beyond those previously established for the existing fire effects program. The intent is to adequately determine the effects of the fire event on key MSO habitat, components and primary constituent elements of MSO critical habitat.

  - Monitoring will include current and new plots established under the approved and funded FMH plot monitoring program.

  - GRCA will initiate a pilot rapid assessment protocol program in the 2010 prescribed fire units. If the program successfully meets the needs of the adaptive management process, GRCA will seek funding and regional approval to continue this program.

- Minimize cutting of trees and snags larger than 18 inches dbh. No trees or snags larger than 24 inches dbh will be cut unless necessary for safety reasons.

STATUS OF THE SPECIES

California Condor

The California condor (*Gymnogyps californianus*) was listed as endangered on March 11, 1967 (32 FR 4001). Critical habitat was designated in California on September 24, 1976 (41 FR 187). Critical habitat has not been designated outside of California. The California condor remains one of the world's rarest and most imperiled vertebrate species. Despite intensive conservation efforts, the wild California condor population declined steadily until 1987, when the last free-flying individual was captured. During the 1980s, captive condor flocks were established at the San Diego Wild Animal Park and the Los Angeles Zoo, and the first successful captive breeding was accomplished at the former facility in 1988. Following several years of increasingly successful captive breeding, captive-produced condors were first released back to the wild in California in early 1992 and in Arizona starting in 1996.

The first release of condors into the wild in northern Arizona occurred on December 12, 1996. They were released within a designated nonessential experimental population area in northern

Arizona and southern Utah. The area is bounded by Interstate 40 on the south, U.S. Highway 191 on the east, Interstate 70 on the north, and Interstate 15 to U.S. Highway 93 on the west. The nonessential experimental population status applies to condors only when they are within the experimental population area. For the purposes of section 7 consultation, when condors are on lands not within the National Wildlife Refuge System or the National Park System, but within the experimental population area, they are treated as if proposed for listing. When condors are on National Wildlife Refuge or National Park System lands within the designated experimental population area, they are treated as a threatened species. Any condors outside of the experimental population area are fully protected as endangered.

Condors are scavengers and rely on finding their food visually, often by investigating the activity of ravens, coyotes, eagles, and other scavengers. Most California condor foraging in northern Arizona occurs in open areas and throughout the forested areas of the rims of Grand Canyon. Typical foraging behavior includes long-distance reconnaissance flights, lengthy circling flights over a carcass, and hours of waiting at a roost or on the ground near a carcass. Condors are also attracted to human activity; newly released individuals and young inexperienced juveniles are more likely to investigate human activity.

Roost sites include cliffs and tall trees, including snags. Nesting sites for California condors include various types of rock formations such as caves, crevices, overhung ledges, and potholes.

As of August 31, 2009, a total of 181 California condors existed in the wild; what is known as the Southwest (Arizona) population of California condors contained 75 individuals. That latter figure includes 65 free-flying individuals previously released into the population, 8 wild-fledged individuals, and 2 chicks in nests. Forty-four released birds and one young produced in the wild have died in northern Arizona since 1996. Most mortalities in northern Arizona have been related to human activity including lead poisoning and shootings.

As part of the program to manage condors within the nonessential experimental population area, all condors released in the area are instrumented and monitored with radio and/or satellite telemetry. Individual condors are tracked and monitored by The Peregrine Fund personnel. Sick or injured condors are rescued, sent to rehabilitation, and re-released when recovered. Dead condors are recovered by The Peregrine Fund field personnel to determine cause of death.

It is difficult to predict potential effects of climate change on California condors. Snyder and Snyder (2000) addressed the potential of adverse weather conditions on condors. They considered the weather in most of the current range of the species to be relatively benign, and observed that events such as hurricanes and tornados are quite rare where condors currently occur. However, they did cite an instance of two condors that may have died from battering during a violent hailstorm in Santa Barbara County, California, in 1936. Climate change in the Southwest is likely to result in warmer temperatures and drier but more variable precipitation. Increased temperatures may affect the ability of condors to effectively thermoregulate for normal behavior. Hotter and drier conditions may also result in fewer or smaller open water sources. Snyder and Snyder (2000)) discussed the possibility of injury or mortality of condors at water sources from which the birds may not be able to extricate themselves. Another possible effect of climate change may be reductions or distributional shifts in large animal populations.

Reductions may result in a decreased food supply for condors in their current range, which would also affect survival and reproduction. Distributional shifts could range from beneficial to detrimental for condors, depending on large mammal and condor distribution of patterns. Finally, climate change may result in more, larger, and longer-lasting fire events. Such fire events can also affect condors by destroying or reducing roost sites, prey availability, and smoke-free conditions for condor reproduction.

Mexican Spotted Owl

The MSO was listed as a threatened species in 1993 (USDI 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 MSO population. The FWS appointed the Mexican Spotted Owl Recovery Team in 1993, which produced the Recovery Plan for the Mexican Spotted Owl (Recovery Plan) in 1995 (USDI 1995). Critical habitat was designated for the MSO in 2004 (USDI 2004).

A detailed account of the taxonomy, biology, and reproductive characteristics of the MSO is found in the Final Rule listing the MSO as a threatened species (USDI 1993) and in the Recovery Plan (USDI 1995). The information provided in those documents is included herein by reference. Although the MSO's entire range covers a broad area of the southwestern United States and Mexico, the MSO 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 U.S. and Mexico.

The U.S. range of the MSO has been divided into six recovery units (RU), as discussed in the Recovery Plan. The primary administrator of lands supporting the MSO in the U.S. 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 MSO known to exist in the U.S. between 1990 and 1993 occurred on lands administered by the Forest Service.

Historical and current anthropogenic uses of MSO habitat include both domestic and wild 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 MSO 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 negative effect on the availability of grass cover for prey species. Recreation impacts are increasing on all forests, especially in meadow and riparian areas. There is anecdotal information and research that indicates that owls in heavily used recreation areas are much more erratic in their movement patterns and behavior. Fuels reduction treatments, though critical to reducing the risk of severe wildfire, can have short-term adverse effects to MSO through habitat modification and disturbance. As the human 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 MSO by further fragmenting habitat and increasing disturbance during the breeding season. West Nile Virus also has the potential to adversely impact the MSO. 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 MSO 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 MSO within the action area. As throughout the West, fire severity and size have been increasing within this geographic area.

Global climate change may also be a threat to the MSO and synergistically result in increased effects to habitat from fire, fuels reduction treatments, and other factors discussed above. Studies have shown that since 1950, the snowmelt season in some watersheds of the western U.S. has advanced by about 10 days (Dettinger and Cayan 1995, Dettinger and Diaz 2000, Stewart *et al.* 2004). Such changes in the timing and amount of snowmelt are thought to be signals of climate-related change in high elevations (Smith *et al.* 2000, Reiners *et al.* 2003). The impact of climate change is the intensification of natural drought cycles and the ensuing stress placed upon high-elevation montane habitats (IPCC 2007, Cook *et al.* 2004, Breshears *et al.* 2005, Mueller *et al.* 2005). The increased stress put on these habitats is likely to result in long-term changes to vegetation, invertebrate, and vertebrate populations within coniferous forests that effect ecosystem function and process.

A reliable estimate of the numbers of owls throughout its entire range is not currently available (USDI 1995), and the quality and quantity of information regarding numbers of MSO vary by source. USDI (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) MSOs 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 RUs.

Researchers studied MSO 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" (Gutierrez *et al.* 2003), found that reproduction varied greatly over time, while survival varied little. The estimates of the population rate of change (Λ=Lambda) 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, the MSO is 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 216 formal consultations for the MSO. These formal consultations have identified incidences of anticipated incidental take of MSO in 426 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 fire and wildland fire-use), 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 MSO. The jeopardy opinion issued for existing Forest Plans on November 25, 1997 was rendered moot as a non-jeopardy/no adverse modification BO was issued the same day.

Mexican Spotted Owl Critical Habitat

The final MSO critical habitat rule (USDI 2004) designated approximately 8.6 million acres of critical habitat in Arizona, Colorado, New Mexico, and Utah, mostly on Federal lands (USDI 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 MSO critical habitat were determined from studies of their habitat requirements and information provided in the Recovery Plan (USDI 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 MSO within mixed-conifer, pine-oak, and riparian forest types that provide for one or more of the MSO'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.

"Primary constituent elements related to canyon habitat include one or more of the following:

- Presence of water (often providing cooler and often higher humidity than the surrounding areas);
- Clumps of stringers of mixed-conifer, pine-oak, pinyon-juniper, and/or riparian vegetation;
- Canyon wall containing crevices, ledges, or caves; and,
- High percent of ground litter and woody debris."

ENVIRONMENTAL BASELINE

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

Because aspects of the proposed action could occur within almost all areas of GRCA, the action area includes the entire park (BA, pages 18-19), including the airspace used for low-level flights. Smoke effects could extend beyond the GRCA. Because GRCA does not anticipate taking action on wildfires within the Inner Canyon FMU, fire suppression actions in the Inner Canyon FMU are not included in the proposed action or covered under this biological opinion, except for smoke effects to the MSO and California condor.

Status of the species and factors affecting the species within the action area

California Condor

Following the release of condors in Arizona in 1996, the birds have matured and become skilled flyers, moving farther and farther from the release site. Although ground triangulation is the primary means of radio-tracking, aerial and satellite-tracking methods are also used to locate birds.

Monitoring data indicate that condors are using habitat throughout the park, with concentration areas in Marble Canyon, Desert View to the Village on the South Rim, and the Village to Hermits Rest on the western portion of the South Rim. The majority of condor summer activity occurs on the South Rim but includes both North and South Rim visitation areas.

In addition to the Grand Canyon area, condors have been observed west to the Virgin Mountains near Mesquite, Nevada; south to the San Francisco Peaks near Flagstaff, Arizona; north to Zion and Bryce Canyon National Parks in Utah; beyond Minersville, Utah; and east to Mesa Verde, Colorado and the Four Corners region.

California condors may be affected by the special flight rules (overflights) that may overlap a portion of the project area. In the biological opinion (AESO file number 02-21-97-F-0085) developed for the special flight rules, we anticipated that an unquantifiable number of condors would be affected by these rules. Take was expected to be in the form of harassment or accidental displacement when startled individuals are flushed from a perch site by the proposed low-level flights. Additional take in the form of killing, estimated at one bird in five years, was anticipated from collisions.

Condors may be affected by condor-human interactions. We have conducted informal and formal consultations with GRCA on projects such as previous prescribed fire and wildland fire-use programs, wildfires, construction projects, and exotic plant management. The consultations have primarily focused on the effects of disturbance and condor-human interactions. Where possible, conservation measures were developed and implemented to help reduce the possibility of the adverse interactions.

Condor-human interactions may also result from recreation activities that occur in GRCA. Condors are also affected by the use of lead ammunition by hunters in areas adjacent to GRCA, resulting in mild contamination of individuals, more serious contamination requiring chelation and recovery, or death.

Mexican Spotted Owl

At GRCA, all known spotted owl home range territories have been found in the canyon areas of the park (the Inner Canyon FMU). Forty-one PACs have been designated. Based on habitat modeling in the canyon, GRCA originally estimated that another 40 potential PACs could possibly be delineated. Most of those potential territories would probably be found in the lower gorge west of Powell Plateau because the majority of side canyons approaching the forested areas of the North and South Rims have been surveyed with owls detected and PACs established (BA, page 63).

However, GRCA subsequently estimated that the Park contains an absolute maximum of 337,102 acres of canyon habitat. The features of canyon habitat include all geologic layers in the canyon from the Toroweap layer down to the Muav limestone as well as pinyon-juniper and mixed conifer vegetation types that occur within canyons. A second layer of potential PAC areas consisting of 58,200 acres was generated by GRCA by placing a 600-acre circle in the head of each canyon within the MSO canyon habitat layer that does not presently contain a designated PAC. GRCA estimated that a potential maximum of an additional 97 PACs beyond the current number could be supported in the canyon (GRCA 2009a).

As a consequence of the survey effort, the primary focus for spotted owl management has become the canyon terrain because most of the MSO territories in the park are associated with canyon habitat. However, radio-tracking of five MSO has provided evidence that owls from inner canyon territories are foraging on the plateau near the canyon rim. Data from these five owls indicates that they are using areas less than 0.5 mile from the rim in piñon-juniper and ponderosa pine habitat for foraging.

Since 2000, 18,300 acres of MSO forest restricted habitat have burned in wildfires, prescribed fires, or wildland fire-use in GRCA. Of that amount, 4,347 acres have been affected by higher severity events (i.e., most key habitat components removed).

MSO may also be affected by the special flight rules (overflights) that overlap a portion of the project area. In the biological opinion (AESO file number 02-21-97-F-0085) developed for the special flight rules, we anticipated that an unquantifiable number of owls would be affected by the special flight rules. Take was expected to be in the form of harassment.

We have conducted informal and formal consultations with GRCA on projects such as previous prescribed fire and wildland fire-use programs, wildfires, construction projects, and exotic plant management that could affect MSO. The consultations have addressed the effects of disturbance of individuals and modifications of MSO habitat. MSO may also be affected to an unknown extent by human disturbance as a result of recreation activities that occur in GRCA.

Mexican Spotted Owl Critical Habitat

The action area is located within MSO critical habitat unit CP-10, which is within the Colorado Plateau Recovery Unit (RU). The Colorado Plateau RU contains eight MSO critical habitat units (CP-1, CP-2, CP-10, CP-11, CP-12, CP-13, CP-14, and CP-15) across three states. Forest critical habitat in the Colorado Plateau RU is the mixed-conifer cover type. Four of the critical habitat units (CP-11, CP-12, CP-13, and CP-14) contain no to very little forest critical habitat (Spotskey and Willey 2000), and habitat supporting the MSO breeding population is almost entirely of the canyon habitat type.

The CP-1 and CP-2 units that contain the Mount Taylor and Zuni Mountains regions contain a total of 32,469 and 161,557 acres, respectively. However, the amount of actual forest critical habitat in CP-1 is 15, 215 acres; of that amount, 1,839 acres have been affected by fire. The amount of actual forest critical habitat in CP-2 is 147,249 acres; of that amount, 6,892 acres have

been affected by fire (pers. comm., Beverly deGruyter, 2009). Forest critical habitat in CP-1 and CP-2 includes the pine-oak cover type in addition to the mixed-conifer cover type.

The rule designating MSO critical habitat indicates that CP-15 contains a total of 21,522 acres. However, Bureau of Land Management states that the unit contains 27,905 acres of forest critical habitat. During 1976-2008, approximately 2,445 acres (9 percent) of the forest critical habitat in CP-15 was burned, probably at a lower burn severity.

MSO critical habitat unit CP-10 plays a unique role in the conservation and recovery of the MSO in the Colorado Plateau RU. It is one of the few critical habitat units in the RU that has a relatively large forest component. Furthermore, it is situated in a fairly central position within the RU. CP-10 is located between the highly productive Upper Gila Mountains critical habitat units to the south in Arizona and New Mexico and MSO critical habitat units and populations to the north in Utah. As such, it likely serves as a landscape matrix for movement of adults and dispersal of juveniles between those areas. The canyon portion of CP-10 supports a relatively large population of nesting MSO. The forest critical habitat portion of the unit has been modeled as dispersal habitat for MSO (Keitt *et al.* 1997). We believe that it is likely that forest critical habitat provides an important foraging resource for both canyon-nesting and dispersing MSO in CP-10. However, data to support the modeled dispersal corridor do not exist in this region and collecting this data should be a priority. The most significant effect to forest critical habitat in CP-10 was the 2006 Warm Fire in the North Kaibab Ranger District, which burned 10,928 acres of MSO critical habitat.

All forest critical habitat in CP-10 is managed by either GRCA or the Kaibab National Forest. Although the proposed GCRA FMP may affect both canyon and forest critical habitat within CP-10, most fire management activities are proposed in forest critical habitat. CP-10 contains a total of approximately 918,847 acres, much of which is not habitat based upon the Recovery Plan habitat definitions (USDI 1995). The unit contains approximately 94,626 acres of forest critical habitat (the mixed conifer cover type). Approximately 31,665 acres (33 percent) of the forest critical habitat in CP-10 has been previously affected by a number of events and actions including wildfire and suppression, wildland fire-use, prescribed fire, salvage logging, hazard tree removal, and fuels reduction treatments. Most of the effects to forest critical habitat have been fire-related, and effects from the fire events can be identified and assigned to one of four fire severity categories: high, moderate-high, moderate-low, and low (Table 3).

Within CP-10, at least 13,817 acres (15 percent) of all forest critical habitat in the unit has been affected by higher level (high and moderate-high) effects to the range of tree species, tree size structure, and shade canopy. Those primary constituent elements have been removed from that acreage, and if their recovery can occur in the future with a potentially warmer and drier climate, recovery to mature mixed conifer forest is likely to take hundreds of years. In addition, another 6,544 acres (7 percent) of the forest critical habitat in CP-10 has been affected by moderate-low level fire effects to the primary constituent elements. GRCA's definition of the moderate-low severity class includes "limited overstory tree mortality." GRCA's fire effects monitoring data show that moderate-low severity fire has resulted in the loss of approximately 38 percent of the large tree component of forest critical habitat within previous fires (GRCA 2009b). However, large tree density ($\geq$12 inches dbh) is expected to remain at least 30 percent of the stand post-fire,

and canopy cover is expected to remain above 40 percent. Approximately 11,129 acres (12 percent) of the forest critical habitat in the critical habitat unit has been affected by low-level effects to the primary constituent elements, presumably affording some protection from high severity wildfire in these areas.

Of the 31,665 acres of forest critical habitat that has been affected by wildfires and fire and fuels management activities in CP-10, approximately 4,484 acres has been secondarily affected by treatments such as hazard tree removal and salvage logging. Those treatments have further affected and reduced the abundance of some primary constituent elements after the initial fires.

Based on current climate change models, the Colorado Plateau RU is likely to become drier and hotter (Karl *et al.* 2009). High-elevation forests are likely to decline, and fires that depend on fine fuels may actually decrease. However, where fuels are adequate, fires may increase in intensity and size. Therefore, it is reasonable to anticipate that the extent of MSO forest critical habitat (the mixed-conifer cover type) will eventually contract. In addition, a drier and warmer climate will likely reduce the ability of burned areas to recover as forest critical habitat for MSO. Drier and hotter conditions may instead result in type conversion of the mixed-confer cover type to vegetation types that may not support, and are not likely to contribute to, the recovery and conservation of the MSO.

EFFECTS OF THE ACTION

Effects of the action refer to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action that will be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur.

Effects of the action are those that may occur from manual/mechanical thinning, from conducting prescribed fires and the decision to manage wildfires for resource benefit (including the effects of fire itself[1]), and from fire suppression actions above the rim (with limited egress below the rim, as discussed below) associated with wildfires and wildland fire-use.

California Condor

Injury or Mortality Due to Fire

The possibility of direct mortality or injury to condors from fire during prescribed fire or wildland fire-use is low. Condors forage and roost in forest habitat in the project area. However, unless they are otherwise hampered, they are relatively mobile and condors should be able to avoid injury from fire.

[1] FWS is currently seeking further clarification on section 7 consultation under the 2009 guidance for Implementation of Federal Wildland Fire Management Policy.

Noise and Visual Disturbance

Noise and activity from manual/mechanical thinning or suppression actions such as fire-line construction, helicopter water drops, and crew staging areas may disturb condors. Disturbance from fire management activities could result in flushing birds from perching, roosting, or scavenging sites. The normal foraging and reproductive behavior of condors may also be temporarily affected by fire activities.

Condors may also be attracted to areas with high levels of activity associated with fire management activities or manual/mechanical thinning operations. This attraction to sites of activity may increase the potential for interaction between condors and humans. Habituation to humans could have negative impacts on condors. Educating firefighters and other personnel about condor concerns will reduce potential negative impacts from suppression and other management activities. A mitigation measure requiring crews to stop activity if condors arrive on the site will be required during manual/mechanical thinning operations. However, if condors are attracted to fire line construction areas during a fire, it may not be possible for firefighters to cease activity if human safety may be compromised. The Resource Advisor assigned to the fire will be notified of the presence of condors and will arrange for hazing of the condors by permitted personnel. Hazing of condors by non-permitted personnel could result in injury to condors, but in rare occasions may be necessary.

Among scheduled activities, the Long Jim (I, II, and III) and Shoshone prescribed fires, and the Orphan Mine WUI thinning will have the greatest potential for disturbing or disrupting condor behavior because of their timing and location. The projects will be of short duration (2 to 3 days) but will occur in spring and summer when condors are most likely to be present and when recent nesting sites in Salt Creek, Grandeur Point, and the Battleship could be in use.

Scheduled North Rim burns with potential to impact condors include the Widforss prescribed fire and the thinning and pile burning in the North Rim developed area. In 2008, condors were recorded at least once over every prescribed burn unit and potential wildland fire-use area on the North Rim.

Smoke

Smoke may affect the ability of condors to fly safely and detect food sources. Smoke may also interfere with normal breeding activity that is necessarily associated with a specific location. Condors are monitored via radio-telemetry, and the location of any nests will be known. In order to minimize the effects of smoke from managed fire, information about condor activity will be incorporated into any decision to initiate a prescribed fire or proceed with a wildland fire managed for resource benefit. Prescribed burning operations are only conducted when weather forecasts and current conditions indicate that smoke will be carried up and away from the canyon with good ventilation on the prevailing winds. Air quality is monitored throughout managed fires using various monitoring equipment employed at several locations in Grand Canyon. If an impending violation is detected during a managed fire, fire managers will adjust management strategies when possible to reduce smoke production and avoid the violation.

Collisions with Aircraft

There have been no collisions or near-collisions between aircraft and condors to date, but the potential exists because condors often share airspace with helicopters. It is reasonable to assume that any increased aviation activity associated with fires, and the possible attraction of condors to this activity, could increase the overall risk of a collision. However, since condors are generally highly visible due to their size, and all condors are fitted with radio-telemetry that identifies their positions, it should be possible to avoid collisions with condors. Any collision with a condor would be a catastrophic accident for both the bird and the aircraft.

Effects to Habitat

Some foraging and roosting areas will be temporarily unavailable while fire and smoke are present. Some roost sites, such as large trees or snags, may be damaged or lost due to project activities. However, these effects are expected to be minimal, as ample roosting habitat is available in GRCA.

Effects to Food Resources

Fire management activities may result in the contamination of condor food sources. In rare cases, aerially-applied fire retardant might be used in suppression activities. To avoid this impact, if retardant is used, GRCA will survey the application area as soon as possible following the application and remove any contaminated carcasses before they can be used by condors.

Summary

In summary, activities associated with prescribed burns, wildland fire-use, and fire suppression may result in injury of or disturbance to condors from smoke, increased levels of noise and human activity associated with fire management, or disturbance from aircraft. Hazing conducted by non-permitted personnel could result in injury to individual birds. Fire may also affect condor habitat and food sources. However, given the vastness of areas used by condors, effects at the population level are unlikely to be significant.

Mexican Spotted Owl

Injury or Mortality Due to Fire Management

The possibility of direct mortality or injury of adult owls from prescribed fire or wildland fire-use is relatively low. Eggs and nestlings are vulnerable to fire, and mortality could occur if young individuals cannot escape from a nest. Juveniles are not highly mobile and not able to fully control their flight until late in the breeding season. If disturbed by heavy smoke or fire, they could become more vulnerable to predation. However, prescribed fire and wildland fire-use activities are not planned below the Grand Canyon rim, so direct effects to nests would only occur if these actions escape to below the rim. MSO have been infrequently observed foraging and using territorial vocalizations of forested plateaus within the project area. The normal breeding, feeding, and sheltering behavior of MSO may be affected where fire management

overlaps occurrences of individuals. However, injury or mortality of adults is unlikely as their mobility should allow them to escape from fire.

Collisions between aircraft and MSO may occur but are unlikely. If a collision did occur, it would likely result in mortality of the individual owl.

Noise And Visual Disturbance

Prescribed fire management includes igniting the fire, monitoring the fire's progress, and conducting activities necessary to keep the fire contained within the unit boundary. Management of a natural start under a fire-use strategy will involve monitoring combined with some containment activities, depending on the appropriate management response selected and resources at risk. Fires managed under a wildland fire-use strategy may require suppression actions along portions of the perimeter to keep the fire from entering areas with sensitive resources or areas that may exhibit undesirable fire behavior. Suppression actions can range from small efforts, such as putting in a fire line around a cultural resource site, to suppressing one flank of a fire while allowing the other to grow. If the fire exceeds the prescription or threatens the pre-established project boundaries, suppression activities may be undertaken. Those activities could result in increased levels of disturbance from personnel on the ground and from aircraft.

Noise and activity from fire actions such as fire line construction, helicopter water drops, helicopter flights, and crew staging areas during the MSO breeding season (March 1 to August 30) may disturb individual owls, both above and below the rim. The normal breeding, feeding, and sheltering behavior of MSO may be affected by these and other fire management activities, particularly since owls from established territories are known to forage above the rim. There are a growing number of studies attempting to describe and quantify the impacts of non-lethal disturbance on the behavior and reproduction of wildlife, and MSO in particular. Delaney *et al.* (1997) reviewed literature on the response of owls and other birds to noise and concluded the following: 1) raptors are more susceptible to disturbance-caused nest abandonment early in the nesting season; 2) birds generally flush in response to disturbance when distances to the source are less than approximately 200 feet and when sound levels are in excess of 95 dBA; and 3) the tendency to flush from a nest declines with experience or habituation to the noise, although the startle response cannot be completely eliminated by habituation. Delaney *et al.* (1999) found that ground-based disturbances elicited a greater flush response than aerial disturbances. Our guidance is to limit potentially disturbing activities to areas ≥0.25 mile from MSO nest sites during the breeding season (March 1 through August 31). This corresponds well with Delaney *et al.*'s (1999) 0.25 mile threshold for alert responses to helicopter flights. In addition, Delaney *et al.* (1999) found that MSO did not flee from helicopters when caring for young at the nest, but fled readily during the post-fledgling period. This may be a result of optimal fleeing decisions that balance the cost-benefit of fleeing. Frid and Dill (2002) hypothesize that this may be explained using predator risk-disturbance theory, and perhaps the cost of an adult MSO fleeing during the nestling period may be higher than during the post-fledgling period.

On the North Rim, the Walhalla Vista, Walhalla Neck, and the Walhalla/Mathes Point prescribed burns occur between 0.5 and 1.5 miles of the Mount Hayden, Atoka, Cottonwood, Manzanita

Creek and Nankoweap South PACs. On the South Rim, the Pipe Creek, O'Neil, and Shoshone PACs are located near, but down several cliff layers from, the Shoshone burn. The Hearst, Watson I-IV, and Buggeln burns are located near the Grandview and Sinking Ship PACs. The Papago burn is located near the Papago Point and Lipan Point PACs. The primary disturbance may be helicopters over the PACs during ignitions and aerial reconnaissance flights. Flights associated with prescribed fires generally occur over a period of 1 to 3 days over the main unit on the plateau. To avoid disturbance from aerial activities, GRCA has included a conservation measure that helicopters will remain at least 1,200 feet (400 meters) over any designated PAC. GRCA has predicted that up to 97 additional PACs could occur in canyon habitat, but these locations are outside the project area; owls that may occur in these unsurveyed areas would not likely be disturbed by noise associated with aerial activities.

To avoid disturbance to MSO during the breeding season, MSO habitat within 0.5 mile of prescribed fire burn units will be surveyed prior to project implementation. GRCA will delay implementation of prescribed burns during the MSO breeding season if MSO are detected during surveys. If a PAC is established, the burn will not take place within the PAC. Noise and disturbance to specific PACs from wildland fire-use or suppression actions are less predictable. However, if these activities occur within 0.25 mile from a PAC during the MSO breeding season, noise and disturbance could cause individuals to abandon microhabitat shelter, interfere with foraging, and disrupt reproductive behavior, including caring for young. This is particularly true for PACs abutting the North Rim of the canyon, whose owls may forage above the rim (at least in close proximity of the rim). In addition, owls that may be nesting in unsurveyed canyon habitat could be similarly disturbed by noise and activities associated with wildland fire-use and suppression actions.

No manual or mechanical treatments will occur within PACs. However, the treatments could occur within or near MSO habitat. The Orphan Mine thinning will occur greater than 0.5 mile from the Bright Angel PAC boundary and greater than 0.7 mile from the core area. The majority of the Yavapai East thinning will occur greater than 0.5 acre from the PAC boundary; a portion will occur between 0.25 and 0.5 mile from the PAC boundary, but greater than 0.5 mile from the core area. A very small portion of the Bright Angel Thinning will occur between 0.25 and 0.5 mile from the Transept PAC. All other treatments are greater than 0.5 mile from any known PAC. Activities associated with manual/mechanical non-fire thinning projects could involve equipment including chainsaws, gas powered trimmers, hand-tools, and wheeled or tracked vehicles. Some disturbance to MSO associated with those activities as described above could result, whether the activities occur in or out of designated PACs. However, pre-project surveys and delaying these treatments until after the breeding season, as needed, should enable GRCA to avoid most disturbance effects.

Smoke

Depending on location, occasional smoke from fire events would have only minor effects to MSO. However, heavy smoke or smoke that persists for longer periods of time at MSO foraging areas, roosts, and PACs adversely affect MSO. The normal breeding, feeding, and sheltering of MSO are likely to be disrupted by heavy or persistent smoke. Individuals can be expected to suffer direct effects if they do not or cannot leave areas inundated by smoke. If they do leave the areas, microhabitat sheltering and foraging would be interrupted, and individuals could also

expose themselves to predators. The reproductive behavior and success of individuals that may leave PACs due to smoke is also likely to be adversely affected. Developing young that cannot leave nest areas are likely to experience the greatest extent of adverse effects.

Several prescribed fire burn units on the North Rim are near MSO PACs. The Walhalla Vista, Walhalla Neck, and the Walhalla/Mathes Point prescribed burns occur between 0.5 and 1.5 miles of the Mount Hayden, Atoka, Cottonwood, Manzanita Creek, and Nankoweap South PACs, all of which may receive smoke during prescribed burning.

On the South Rim, the Pipe Creek, O'Neil, and Shoshone PACs are located near, but down several cliff layers from the Shoshone burn. The Hearst, Watson I-IV, and Buggeln burns are located near the Grandview and Sinking Ship PACs. The Papago burn is located near the Papago Point and Lipan Point PACs. Those seven PACs may experience short-term smoke impacts, which are not expected to exceed 24 consecutive hours.

In addition, MSO within likely occupied habitat (per GRCA habitat modeling) may also be adversely impacted by smoke. These areas are currently only predicted to be occupied, but additional surveys during the life of this project will likely identify some territories within these areas (up to 97 potential PACs per the GRCA).

Effects to Protected Habitat

No manual/mechanical treatments, or prescribed burns are planned to occur within PACs and/or protected steep-slope habitat (e.g., mixed conifer). GRCA does not intend for wildland fire-use fires to encroach on PACs below the rim, but depending on fuels at the rim, this could occur. Habitat within PACs could be affected if prescribed fire or wildland fire-use encroaches into PACs below the rim. Firefighters will probably not undertake suppression activities below the rim because of the inaccessible and highly dangerous nature of the terrain.

Because of continuity of habitat, the North Rim Manzanita, Cottonwood, Atoka, and South Nankoweap PACs may be encroached by fire off of the rim. Encroachment of prescribed burns out of the Peninsulas FMU into the Inner Canyon FMU is possible due to the lack of solid burn perimeters on the canyon rim. The Walla Valley and the Roost-West Basin burns are 3 miles and 2 miles, respectively, from the Dragon PAC. The fires could result in encroachment of fire into the Dragon PAC, resulting in some loss of habitat within the PAC. During 2001 to 2008, a total of 176 acres of Inner Canyon PACs received low severity fire from encroachment of wildland fire-use, and no acres were burned through prescribed fires. Because most of the rim edge along the North Rim has already burned at least once, GRCA expects that below-the-rim burning during the FMP is anticipated to be less than what occurred from 2001 to 2008.

On the South Rim, the Pipe Creek, O'Neil, and Shoshone PACs are located near, but down several cliff layers from the Shoshone burn. The Hearst, Watson I-IV, and Buggeln burns are located near the Grandview and Sinking Ship PACs. The Papago burn is located near the Papago Point and Lipan Point PACs. Fire is not expected to extend below the rim because of sparse fuels near the rim and the ignition patterns that will be used.

GRCA has estimated that a potential maximum of an additional 97 PACs beyond the current number could be supported in the canyon (GRCA 2009a). Potential additional PACs could contain forest (including steep-slope) or canyon habitat. Habitat within these potential PACs could also be affected as described above for designated PACs if fire enters these areas.

Effects to Restricted Habitat

In general, treatment of MSO restricted habitat with low to moderate-low intensity surface fire or other low level treatments should aid in protection of the key habitat components from high intensity wildfires (USFWS 2004). Higher severity fire (high and moderate-high severity burn categories) does not retain the important structural components of MSO habitat (large trees, large snags in a functional context, large logs, hardwoods). High severity fire completely removes these key habitat components, while moderate-high severity fire removes the majority of them. Moderate-low severity fire should retain most of these key habitat components, but may adversely affect some components reducing the total number of large trees, total basal area, canopy cover, and number of large logs. However, GRCA expects that threshold conditions will continue to be met in the lower severity burn areas as well as across the action area as a whole (GRCA 2009b).

Under the proposed action, GRCA indicates that up to 30 percent of the MSO restricted forest habitat within GRCA will be affected by fire classified as moderate-high or high severity after the project has been fully implemented. Since 2000, 18,300 acres of MSO restricted habitat have already burned at least once in wildfires, prescribed fires, or wildland fire-use in GRCA. Of that amount, 4,347 acres have been affected by higher severity events (i.e., most key habitat components removed). Under the proposed action, an additional 3,783 acres of restricted mixed-conifer habitat above the rim could burn at moderate-high or high severity.

The proposed action did not identify a projected amount of lower severity fire that is expected to occur during implementation of the project. Although low severity fire does afford some protection to the key habitat components of restricted habitat over the long-term, there may also be short-term adverse effects. Based on GRCA's fire effects monitoring data, effects from moderate-low severity fire can be fairly extensive, particularly reducing number of large trees. However, the prudent use of treatments under the proposed action should reduce the likelihood of much higher losses of habitat due to stand-replacing wildfire, as long as treatments are carefully placed to maintain habitat connectivity for breeding, foraging, and dispersal activities. We are depending on close coordination between GRCA and us during implementation of the FMP and application of the adaptive management program to ensure that areas of high severity burning are minimized and sufficient key habitat components are retained through the action area.

There are 3,782 acres of mixed-conifer restricted habitat below the rim, of which 1,661 acres burned between 1980 and 2008 (BA, page 66). The GRCA anticipates that little additional acreage will burn during the life of the plan as the areas adjoining this mixed-conifer habitat above the rim have been treated with prescribed fire in the recent past.

Summary

In summary, prescribed burns, wildland fire-use, and fire suppression activities may result in injury of or disturbance to owls from smoke, and increased levels of noise and activity. Fire itself during prescribed burns and wildland fire-use, is anticipated to result in effects to, and loss of, some key habitat components of MSO restricted habitat. However, fires have and always will occur in forested portions of GRCA, and the controlled nature of the proposed action is likely to reduce the potential for uncontrolled high-severity natural fires into the future.

Mexican Spotted Owl Critical Habitat

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 statutory provisions of the Act to complete the following analysis with respect to critical habitat.

In general, treatment of forest critical habitat with low to moderate-low intensity surface fire or other low level treatments should aid in protecting the primary constituent elements and the functionality of the critical habitat from high severity wildfires (USFWS 2004). Higher severity fire (high and moderate-high severity categories) does not retain the important structural components of critical habitat (the PCEs of: a range of tree species $\geq$ 12 inches dbh; a shade canopy of 40 percent or more; and high volumes of fallen trees and other woody debris). High-severity fire completely removes these PCEs, while moderate-high severity fire removes the majority of them. Moderate-low severity fire should retain most of these PCEs, but based on fire effects monitoring conducted by the GRCA, there will likely be a reduction in the number of large trees following moderate-low severity burning (GRCA 2009b).

Under the proposed action, GRCA indicates that up to 30 percent of the forest critical habitat within GRCA may be affected by fire classified as moderate-high or high severity after the project has been fully implemented. Since 2000, 18,300 acres of MSO critical habitat have burned in wildfires, prescribed fires, or wildland fire-use in GRCA. Of that amount, 4,347 acres have been affected by higher severity events (i.e., most primary constituent elements removed). Under the proposed action, an additional 3,783 acres could burn at moderate-high or high severity.

Forest Critical Habitat

GRCA has conducted some monitoring of the fires that have occurred under the previous fire programs (GRCA 2009a, BA pages 85-92). The following discussion is based on this monitoring and known fire effects to the PCEs of MSO forest critical habitat.

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 a trunk diameter of 12 inches (0.3 meters) or more when measured at 4.5 feet (1.4 meters) from the ground.

Most large trees were killed (79 percent) after moderate-high severity fire, and all trees were killed (100 percent) after high severity fire. The large tree component was also affected with moderate-low (38 percent mortality) and low (16 percent mortality) severity fire, but contributed a larger proportion of the overall tree density two years post-fire due high mortality of trees < 12 inches dbh.

The GRCA provided pre-fire species composition in their monitoring report, but no post-fire species composition. The range of tree species was likely greatly altered by moderate-high and high severity fire. Tree species more susceptible to fire (*Abies concolor, Pseudotsuga menzeisii, Picea engelmanni, Abies lasiocarpa*) were likely represented less post-fire, especially after higher severity fire. Therefore, we assume these tree species will be most affected by fire, resulting in some loss of species diversity, depending on the burn severity.

Although basal area is not the unit of measurement of the PCE, it is another way to measure and, in this case, confirm the effects of fire on this PCE. Basal area of large trees was significantly reduced (74 percent) as a result of moderate-high severity fire, and completely (100 percent) reduced due to high severity fire. Basal area of large trees was also affected in moderate-low (30 percent reduction) and low (12 percent reduction) severity fire, and remained near or above 100 square feet per acre.

A shade canopy created by the tree branches covering 40 percent or more of the ground.

The PCE was present before (60 percent canopy cover) but was not retained after (37 percent canopy cover) moderate-high and high severity fire. The sample size was small and the effects were recorded one year after the fire events. Thus, since mortality continues for several years post-fire, it is likely that canopy cover will decline further in the forest critical habitat that sustained moderate-high and high severity fire, with virtually all canopy cover gone in the high severity fire portion. In low and moderate-low severity areas, shade canopy did not change significantly between pre-fire and one year post-fire measurements, but remained above 40 percent cover.

Large dead trees (snags) with a trunk diameter of at least 12 inches (0.3 meters) when measured at 4.5 feet (1.4 meters) from the ground.

With the significant loss of density and basal area of live trees as a result of moderate-high and high severity fire, it is not unexpected that snag density increased after higher severity fires. However, retention or increase of snag density does not provide for maintenance or improvement of this PCE when the matrix of live trees is removed. Thus, the retention or increase of snags as a result of moderate-high and high severity fire does not contribute to the overall functionality of forest critical habitat when the live tree component is mostly or completely gone, but may provide areas for foraging (Bond *et al.* 2009). Average snag density was not significantly different between pre-burn and two year post-burn measurements in low and moderate-low severity areas.

Critical habitat areas near the canyon rims and PACs will likely be used more frequently by foraging MSO, regardless of the burn severity that occurs. Higher severity fire may result in

habitat fragmentation to a degree that will result in patches that are unusable by MSO for foraging, due to the loss of necessary cover. Bond *et al*. (2009) examined the use of habitat by seven California spotted owls (*Strix occidentalis occidentalis*) in four territories four years after fire. Three nests were located in mixed-conifer forests with two in areas of moderate severity burns and one in an area of low severity burn. Another nest was located in an unburned area of mixed-conifer–hardwood forest. For roosting during the breeding season, spotted owls selected low-severity burned forest and avoided moderate and high severity burned areas; unburned forest was used in proportion with its availability. Within one kilometer of the center of their foraging areas, spotted owls selected all severities of burned forest and avoided unburned forest. Beyond 1.5 kilometers (0.9 mile), there were no discernable differences in use patterns among burn severities. Most owls foraged in high-severity burned forest more than in all other burn categories; high-severity burned forests had greater basal area of snags and higher shrub and herbaceous cover, parameters thought to be associated with increased abundance or accessibility of prey.

High volumes of fallen trees and other woody debris.

The PCE, as represented by coarse woody debris (down logs greater than 3 inches in diameter), decreased significantly (reduced 32 percent) due to moderate-high severity fire one year after the fire events. A smaller (8 percent) reduction occurred as a result of high severity fire. Moderate-low severity fire resulted in the largest (52 percent) reduction of the PCE, and low severity fire resulted in the next highest reduction (29 percent). Additional coarse woody material was contributed in higher severity burn areas post-fire due to tree mortality. GRCA expects that greater than 40 percent of large logs present prior to fire will be retained after fire in areas classified as low and moderate-low severity.

The reduction of large logs is significant especially in the short-term when ground cover is needed to help maintain soil integrity and contribute to the ultimate recovery of burned areas. In addition, as for the snag PCE, retention or increase of log density alone provides no maintenance or improvement of critical habitat when the matrix of live trees is removed.

A wide range of tree and plant species, including hardwoods.

GRCA provided no information regarding tree species. The large to complete removal of the live large tree component suggests that this PCE was significantly affected where moderate-high and high severity fire has occurred in GRCA. The range of tree species was likely reduced due to the mortality of non-hardwood trees that are more susceptible to fire (*Abies concolor, Pseudotsuga menzeisii, Picea engelmanni, Abies lasiocarpa*). The observed effects to the live large tree component suggests that the hardwood component was also affected by moderate-high and high severity fire.

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

With the significant loss of density and basal area of live trees as a result of moderate-high and high severity fire, it is not unexpected that ground cover species richness and cover was retained or increased after higher severity fires. Retention or increase of plant ground cover provides no

maintenance or improvement of critical habitat when the matrix of live trees is removed. However, these areas may provide better opportunities for foraging (Bond *et al.* 2009). Average understory plant species richness and average plant cover remained unchanged in moderate-low severity areas. .

Canyon Critical Habitat

No manual/mechanical treatments or prescribed burns are planned to occur below the rim. In addition, GRCA does not intend for wildland fire use fires to encroach on PACs below the rim, but this could occur. Canyon critical habitat could be affected if prescribed fire or wildland fire-use encroaches below the rim. Firefighters will probably not undertake suppression activities below the rim because of the inaccessible and highly dangerous nature of the terrain.

From 2001 through 2008, a total of 1,996 acres, which were not necessarily canyon critical habitat, burned below the rim due to encroachment by prescribed fire from the North Rim (BA, page 66). Approximately 519 acres (26 percent) burned as moderate-high and high severity fire. During the same time period, a total of 4,362 acres burned below the rim due to wildland fire-use. Approximately 1,003 acres (23 percent) burned as moderate-high and high severity fire.

During the same time period, 94 acres burned below the rim on the South Rim. The amount of higher severity fire is unknown.

Thus, in the worst-case scenario, up to 6,358 acres of canyon critical habitat burned in GRCA from 2001 through 2008. Up to 1,616 acres (25 percent) burned as higher severity fire. GRCA provided no information regarding effects of fire to the primary constituent elements of canyon critical habitat However, anticipated effects to canyon critical habitat are described below

Presence of water (often providing cooler and often higher humidity than the surrounding areas).

The presence and maintenance of water and humidity in canyon critical habitat is the result of at least three factors. Those factors are water from springs, precipitation, and cover provided by the substrate or vegetation. Significant losses of vegetation above or below the rims of the canyon may contribute to less retention of surface water. Less vegetation outside of canyon critical habitat may also have affected the extent and timing of runoff to canyon critical habitat. Reduction of vegetation may also affect the recharging of ground water and thus the flow of springs. The extent of such effects to the presence of water in canyon critical habitat are unknown.

Clumps or stringers of mixed-conifer, pine-oak, pinyon-juniper, and/or riparian vegetation.

Effects would be similar to those described above for the PCEs of forest critical habitat related to diversity and size of trees and shade canopy, although the extent and intensity of fire below the rim are expected to be minor.

Canyon wall containing crevices, ledges, or caves

Fire management activities would have no effect in the creation, maintenance, or destruction of these features.

High percent of ground litter and woody debris.

Effects would be similar to those described above for the PCEs of forest critical habitat related to high volumes of logs and woody debris, although the extent of fire below the rim 2 expected to be minor.

Summary

In summary, the forest critical habitat PCEs most affected by moderate-high and high severity fire are the large trees ≥12 inches dbh, shade canopy, and a wide variety of tree species. In the short term, most large logs and woody debris are also removed. Areas of high severity fire may provide improved opportunities for foraging, depending on the location of these areas within or near owl territories.

Implementation of the proposed action will increase the total areas affected by high and moderate-high severity fire in the action area and in CP-10, although the same effects due to unmanaged wildland fire would likely be at least as severe. In these areas, most PCEs will be removed by fire and will take a considerable time for recovery to mature mixed-conifer forest. Based on GRCA's predictions, implementation of the proposed action will result in the reduced functionality of up to 3,783 acres. Cumulatively, this will result in the reduced functionality of 17,600 acres (19 percent) of all forest critical habitat in CP-10 due to moderate-high and high-severity fire. However, the prudent use of treatments under the proposed action should also reduce the likelihood of much higher losses of critical habitat due to stand-replacing wildfire, while maintaining a mosaic forest structure, habitat connectivity, and function of the critical habitat unit for owl breeding, foraging, and dispersal activities. We are depending on close coordination with GRCA during implementation of the FMP and application of the adaptive management program to ensure that areas of high severity burning are minimized and habitat connectivity is maintained throughout the action area.

Since prescribed fire and wildland fire-use are not planned actions below the rims, effects to canyon critical habitat would be limited to fires that may encroach from these treatments below the rim. Based on information GRCA has provided, we do not anticipate significant areas of canyon critical habitat will be affected by the proposed action.

[2] 13,817 acres of forest critical habitat in CP-10 already affected by high and moderate-high severity fire, plus up to 3,783 acres of high and moderate high severity fire from the proposed action.

CUMULATIVE EFFECTS

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.

The scenic over-flights program at Grand Canyon is conducted by private non-Federal entities, but regulated by the Federal Aviation Authority. At the present time, a new route structure is being developed. Because the route structure will be authorized by Federal agencies, section 7 consultation on the action is anticipated.

The action area occurs entirely on Federal land, and therefore few non-Federal actions are likely to occur. Ongoing private actions within the action area include various forms of recreation such as sightseeing, hiking, and biking. Any effects are expected to be minimal.

Additional cumulative effects are likely to occur from wildfires and managed fire for resource benefits on other land ownerships within CP-10. Because current Forest Service policy does not require programmatic section 7 consultation with us on managing unplanned fires, these actions will be subject to consultation only on an emergency basis and will only address effects due to suppression. Therefore, effects (including those of higher severity fire) that could occur from managing fire for resource benefits on the Forest Service portion of CP-10 are unknown but could reduce the quality of the forest critical habitat in this critical habitat unit, if subjected to higher intensity fires.

CONCLUSION

California Condor

After reviewing the current status of the California condor, the environmental baseline for the action area, the effects of the proposed project in Grand Canyon National Park, and the cumulative effects, it is our biological opinion that the Grand Canyon National Park Fire Management Plan, as proposed, is not likely to jeopardize the continued existence of the California condor. No critical habitat has been designated for this species outside of California; therefore, none will be affected.

We present this conclusion for the following reasons:

1. Implementation of the conservation measures that are part of the proposed action should be effective in reducing the impacts of the proposed project on the California condor.

2. Implementation of the proposed action will not impede recovery of the California condor within the non-essential experimental population area.

Mexican Spotted Owl and its Critical Habitat

After reviewing the current status of the Mexican spotted owl, the environmental baseline for the action area, the effects of the proposed project in Grand Canyon National Park and the cumulative effects, it is our biological opinion that the Grand Canyon National Park Fire Management Plan, as proposed, is not likely to jeopardize the continued existence of the Mexican spotted owl and is not likely to destroy or adversely modify its designated critical habitat.

We present this conclusion for the following reasons:

1. Although prescribed fire and wildland fire-use treatments in MSO restricted habitat and designated critical habitat may result in the loss or reduction of some key habitat components and primary constituent elements within some treatment areas, the proposed action will also reduce the threat of severe, stand-replacing wildfire across the landscape.

2. Although there may be some loss of MSO habitat within PACs due to fire or fire management actions that encroach below the rim, we expect these losses will be small and that key habitat components important for nesting, roosting, and foraging activities, and primary constituent elements of canyon critical habitat, will continue to be available.

3. The majority of effects will be limited to forest critical habitat/mixed-conifer restricted habitat. Application of the adaptive management program with our involvement will ensure that sufficient habitat necessary for dispersal and foraging across the critical habitat unit will continue to be available. We believe that forest and canyon critical habitat in the unit will continue to serve their conservation functions for MSO, and implementation of the proposed action will not preclude recovery.

4. The implementation of the proposed action is not expected to impede the survival or recovery of MSO within the Colorado Plateau Recovery Unit.

The conclusions of this biological opinion are based on full implementation of the project as described in the Description of the Proposed Action section of this document, including any Conservation Measures that were incorporated into the project design.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation 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 National Park Service so that they become binding conditions of any grant or permit issued, as appropriate, for the exemption in section 7(o)(2) to apply. The National Park Service has a continuing duty to regulate the activity covered by this incidental take statement. If the National Park Service (1) fails to assume and implement the terms and conditions or (2) fails to require an applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the National Park Service 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 TAKE

California Condor

The final rule designating the California condor non-essential experimental population area in Arizona and Utah [FR 61(201):54044] states that throughout the experimental population area, an agency or individual will not be in violation of the Act if take (including killing or injuring) of a California condor is unavoidable and unintentional, and provided that such take is non-negligent and incidental to a lawful activity and is reported as soon as possible.

Even with the implementation of the conservation measures of the proposed project, the nature of the project (which includes prescribed and managed fire and smoke, possible interaction with humans, condors and aircraft in the same airspace, and some noise disturbance), and the behavior of condors make it reasonably certain that condors will be harmed and/or harassed by fire management activities at some point during project implementation. Thus, we anticipate that incidental take of California condors is likely to occur.

Because condors that occur in the project area are known and are monitored on a daily basis, determining take (particularly death, injury, or harassment through disturbance of behavior) of individuals or a nest will be relatively straightforward. Therefore, we expect that the death or injury of one condor or failure of a nest as a result of the project will be detectable. The death of even one individual due to project activities would represent a significant loss to recovery of California condors. Any project that is likely to result in such incidental take of condors should be immediately reevaluated before such take occurs. If death or injury of one individual, or disturbance of one nest site resulting in nest failure occurs, reinitiation of consultation on the proposed action will be required.

We also anticipate that take of condors could include harassment of California condors resulting from: interaction with humans during wildland fire-use activities on the ground either

unintentionally due to noise and disturbance from fire management activities or smoke, or hazing by non-permitted personnel for the purpose of safety for condors or humans. We anticipate that non-lethal or injurious harassment may occur to numerous condors over the life of the project. This harassment will be difficult to measure due to the landscape-scale nature of the proposed action and the behavior and distribution of the condor.

Mexican Spotted Owl

For the purposes of considering incidental take of MSO from the proposed action under consultation, incidental take can be anticipated as either the direct mortality of individual birds or the alteration of habitat that affects the behavior (i.e. breeding or foraging) of birds to such a degree that the birds are considered lost as viable members of the population and thus "taken." They may fail to breed, fail to successfully rear young, raise less fit young, or desert the area because of disturbance or because habitat no longer meets the owl's needs. Current section 7 consultation policy provides for incidental take if an activity compromises the integrity of a PAC. Actions outside PACs will generally not be considered incidental take.

We anticipate that MSO associated with one PAC will be affected to the extent that incidental take of MSO will occur. This taking could be in the form of death, injury, harm, or harassment of up to two adults and associated eggs/juveniles from smoke disturbance, or habitat loss due to fire or fire management activities.

Authorized taking will be considered to have been exceeded if fire or suppression actions affect more than one PAC in any of the following manners:

1. Over 10 percent of the PAC experiences habitat modification due to moderate-high or high severity fire or fire management actions.

2. Smoke is heavy and persistent within a known 100-acre core area during the MSO breeding season (March 1-August 31) for more than 48 hours.

3. Suppression actions occur in or over a known 100-acre core area during the breeding season.

We recommend that if, during the duration of the proposed action, any PAC is affected in a manner described above, the GRCA reinitiate consultation so as to avoid exceeding the amount of authorized taking.

The Fish and Wildlife Service will not refer the incidental take of any migratory bird or bald eagle for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. 703-712), or the Bald and Golden Eagle Protection Act of 1940, as amended (16 U.S.C. 668-668d), if such take is in compliance with the terms and conditions specified herein.

EFFECT OF THE TAKE

In this biological opinion, the FWS determines that this level of anticipated take is not likely to

result in jeopardy to the California condor or MSO or destruction or adverse modification of MSO critical habitat for the reasons stated in the Conclusions section.

REASONABLE AND PRUDENT MEASURES

California Condor

Pursuant to section 7(b)(4) of the Act, the following reasonable and prudent measure is necessary and appropriate to minimize take of California condors:

1. GRCA will avoid impacting nesting condors.

Mexican Spotted Owl

Pursuant to section 7(b)(4) of the Act, the following reasonable and prudent measures are necessary and appropriate to minimize take of Mexican spotted owls:

1. GRCA shall minimize effects to MSO PACs.

2. Personnel education/information programs and well-defined operational procedures shall be implemented.

3. Fire activities shall be carried out in a manner to reduce potential for take of MSO through habitat loss outside of PACs.

4. GRCA shall document all actions, report incidental take and owl occurrences, and monitor the effects of the proposed action on MSO habitat. Those findings shall be reported to us by January 31 of each year and shall, with our involvement, be incorporated into the adaptive management program.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the National Park Service must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

California Condor

The following terms and conditions implement reasonable and prudent measure 1:

1.1. Wildland fire-use projects shall not occur within 0.5 mile of active condor nesting sites. The active nesting season is February 1 to September 30. These dates may be modified based on the most current information regarding condor nesting and coordination with the GRCA wildlife biologist and the FWS.

1.2. GRCA will manage fires so that smoke will not inundate condor nests. This may include delaying ignition of prescribed fire and suppressing all or portions of managed fires if weather and wind conditions may result in heavy and/or persistent smoke at active condor nests.

1.3. Aircraft associated with fire activities will stay at least 1.0 mile away from active condor nest locations and vicinities except when human safety would be compromised. The active nesting season is February 1 to September 30. These dates may be modified based on the most current information regarding condor nesting and coordination with the GRCA wildlife biologist and the FWS.

Mexican Spotted Owl

The following terms and conditions implement reasonable and prudent measure 1:

1.1. GRCA shall ensure that no more than one PAC is affected to the extent described above (in the Amount and Extent of Take section) for the life of the program.

1.2. Where physically practicable and in a manner that does not compromise human safety in any way, delineate and keep wildland fire and suppression activities out of the 100-acre core areas for any PAC affected by wildland fire or suppression activities.

1.3. All fire actions in and near (within 0.5 mile of) PACs will occur, to the maximum extent possible, using minimum impact suppression methods.

1.4. Areas of disturbance created for fire actions shall be located outside of MSO PACs, whenever possible.

The following terms and conditions implement reasonable and prudent measure 2:

2.1. All field personnel who implement any portion of the proposed action shall be informed of regulations and protective measures as described herein for the MSO. All field personnel shall be informed that intentional killing, disturbance, or harassment of threatened species is a violation of the Act and could result in prosecution. A wildlife biologist will present a program regarding the management of fire in threatened and endangered species habitat to all personnel involved in the fire program.

2.2. GRCA shall review with fire and natural resources staff actions after each year of activity and prior to the next MSO breeding season. Such review will take into account the prior effects of all fire activities in the project area.

2.3. GRCA shall ensure that all pertinent information from the reasonable and prudent measures of this biological opinion are included in the burn or treatment plans for all fire management actions and in wildfire suppression decision documents.

2.4. GRCA shall coordinate with our Flagstaff Suboffice during the decision process for wildland fire management and suppression actions in MSO habitat.

The following terms and conditions implement reasonable and prudent measure 3:

3.1. A Resource Advisor will be available for all fire activities associated with MSO habitat. Resource Advisors shall be provided adequate information from qualified Park biologists with knowledge of the MSO and its habitat. The Resource Advisor shall possess maps of all MSO habitat and PACs in the project area. The GRCA Section 7 Coordinator shall coordinate MSO concerns and serve as an advisor to the Incident Commander/Incident Management Team. The Resource Advisor will be on the ground and will report to the GRCA Section 7 Coordinator and park biologist, who will report to the FWS. The Section 7 Coordinator and/or Park biologist will be responsible for coordination with our Flagstaff Suboffice and shall monitor fire management and suppression activities to ensure that protective measures endorsed by the Incident Commander/Incident Management Team are implemented.

3.2. MSO habitat disturbed during fire suppression activities associated with fire actions such as fire lines, crew camps, and staging areas, shall be rehabilitated, including the obliteration of fire lines to reduce erosion, protect disturbed areas from invasive species, and to prevent their use by vehicles or hikers. Such rehabilitation/obliteration shall be inspected as necessary following the event to ensure effectiveness.

3.3. In order to ensure that all MSO habitats have been correctly identified in the project area, GRCA will work with the FWS Flagstaff Suboffice to closely re-examine all available data regarding the extent of MSO habitat in the project area. Any MSO habitat that was not previously identified will be added to MSO habitat databases and maps so that it can be managed appropriately. This re-examination (and any necessary re-adjustment) will be led by knowledgeable and qualified GRCA personnel.

The following terms and conditions implement reasonable and prudent measure 4:

4.1. If a MSO is encountered during the fire, the Resource Advisor shall be advised immediately. The Resource Advisor shall assess potential harm to the owl and advise the Incident Commander/Incident Management Team of methods to prevent harm. The Resource Advisor shall maintain a record of any MSO encountered during suppression activities. The information shall include for each owl the location, date, and time of observation and the general condition of the owl.

4.2. By January 31 of each year, GRCA shall submit a report to us detailing that calendar year's actions. The report shall document the areas and acreage burned, the type of fire (prescribed fire, wildland fire-use, wildfire), the name(s) of any PAC(s) subjected to fire activity, the amount of MSO habitat subjected to fire activity, the extent of fire actions, the prescriptions applied to the action, the extent of effects to MSO key habitat components and PCEs of critical habitat, photographs depicting effects, the implementation and effectiveness of the terms and conditions of this biological opinion, information about MSO monitored or encountered, any rehabilitation completed, quantification of any incidental take as defined in this biological opinion, and any recommendations for actions in the upcoming year(s). A map shall be provided which will include each fire event that occurred. GRCA shall keep and maintain a map depicting cumulative fire information for the project area.

4.3. By March 1 of each year, prior to any implementation of prescribed or wildland fire use that year, GRCA will meet with our Flagstaff Suboffice to review the annual report and discuss the upcoming year's plans relative to the previous year's actions and cumulative actions. If the observed proportion of the fire events in high to moderate-to-high severity categories are greater than that expected in the Effects of the Action section of this biological opinion, then prescriptions shall be adjusted to ensure that fire severity of future events is reduced.

Review requirement: The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize incidental take that might otherwise result from the proposed action. If, during the course of the action, the level of incidental take is exceeded, such incidental take would represent new information requiring review of the reasonable and prudent measures provided. GRCA must immediately provide an explanation of the causes of the taking and review with the AESO the need for possible modification of the reasonable and prudent measures.

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.

1. We recommend that GRCA continue monitoring existing MSO PACs.

2. We recommend that GRCA ensure that sufficient monitoring of the effects of fire on key habitat components of MSO habitat and primary constituent elements of MSO critical habitat is conducted after each fire event. Such monitoring may require additional plots beyond those previously established for the existing fire effects program. The intent of this monitoring is to determine the effects of the event on the key habitat components of MSO habitat and primary constituent elements of critical habitat.

3. We recommend that GRCA conduct fire severity monitoring within MSO restricted habitat as soon as possible after each fire event to ensure that the most accurate classification of burn severity is applied to the fire.

4. We recommend that GRCA work with us to develop and fund a research project to study foraging, dispersal, and other habitat use of MSO on the Kaibab Plateau.

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.

In addition, if GRCA does not complete fire effects monitoring for the adaptive management program, or exceeds 30 percent high severity over the first five years of the FMP, reinitiation may be required.

In keeping with our trust responsibility to American Indian Tribes, when an agency consults with us on a proposed action that may affect Indian lands, Tribal trust resources, or Tribal rights, we provide a copy of the final biological opinion to affected and interested Tribes and the Bureau of Indian Affairs.

We appreciate Grand Canyon National Park's efforts to identify and minimize effects to listed species from this project. For further information, please contact Bill Austin (928) 226-0614 (x102) or Brenda Smith (x101) of our Flagstaff Suboffice. Please refer to the consultation number, 22410-2003-F-0485, in future correspondence concerning this project.

/s/ Steven L. Spangle

cc: Tribal Liaison, Southwest Region, Fish and Wildlife Service, Albuquerque, NM (ARD-EA)
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Shaula Hedwall, Fish and Wildlife Service, Flagstaff, AZ
Chief, Habitat Branch, Arizona Game and Fish Department, Phoenix AZ
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Environmental Specialist, Environmental Services, Western Regional Office, Bureau of Indian Affairs, Phoenix, AZ
Chairman, Chemehuevi Tribe, Havasu Lake, CA
Environmental Director, Chemehuevi Tribe, Havasu Lake, CA
Director, Chemehuevi Cultural Resources Center, Havasu Lake, CA
Chairperson, Havasupai Tribe, Peach Springs, AZ
Director, Natural Resources, Havasupai Tribe, Peach Springs, AZ
Chairman, Hopi Tribe, Kykotsmovi, AZ
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Director, Cultural Resources, Kaibab Band of Paiute Indians, Fredonia, AZ
Environmental Director, Kaibab Band of Paiute Indians, Fredonia, AZ
Director, Wildlife, Fisheries and Parks, Kaibab Band of Paiute Indians, Fredonia, AZ
President, Navajo Nation, Window Rock, AZ
Director, Environmental Protection Agency, Navajo Nation, Window Rock, AZ
Director, Historic Preservation Department, Navajo Nation, Window Rock, AZ
Director, Navajo Nation Department of Fish and Wildlife, Window Rock, AZ
Governor, Pueblo of Zuni, Zuni, NM
Director, Zuni Heritage and Historic Preservation Office, Zuni, NM

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APPENDIX A - CONCURRENCE

This appendix contains our concurrence with your "may affect, not likely to adversely affect" determinations for sentry milk vetch.

We concur with your determination that the proposed project may affect, but is not likely to adversely affect, the sentry milk vetch. We base this concurrence on the following:

1. GRCA has committed to not allow any prescribed fires in occupied or unsurveyed sentry milk-vetch habitat by pre-treating areas prior to prescribed burning to protect sensitive resources. These measures should protect the plants from any impacts from prescribed burning conducted by GRCA.

2. No manual or mechanical fuel treatments will be conducted near or in the species' habitat, hence there will be no impacts from these activities.

3. Sentry milk-vetch grows on rocky limestone ledges with little soil and little to no fuels capable of carrying fire. The Recovery Plan for this species does not mention wildfire as a threat to the species or its habitat. Because wildfire is not likely to begin in or carry through the habitat for this species, the need for suppression actions along the rim habitat for this species is so remote as to be discountable.

4. Management of wildland fire-use near the habitat for this species will consider the location of fire-sensitive resources, and GRCA has committed to restricting fire management activities from this species' habitat. GRCA has identified unsurveyed habitat that has the likelihood of supporting this species and will continue their survey efforts. Completing these surveys expeditiously will ensure that accurate location information is available for management of wildland fire-use in the vicinity of occupied or suitable habitat. This information will allow GRCA to avoid impacts from wildland fire-use to both known and suitable habitat for this species.