BIOLOGICAL OPINION SUMMARY
(Johnson Peak Fire Management Plan)

Date of opinion: November 16, 1999

Action agency: U.S. Forest Service, Coronado National Forest

Project: Johnson Peak Fire Management Plan

Location: Chiricahua Mountains, Cochise County, southeastern Arizona

Listed species affected: Endangered Yaqui chub (*Gila purpurea*) and Threatened Mexican spotted owl (*Strix occidentalis lucida*)

Biological opinion: Non-jeopardy for the Yaqui chub and Mexican spotted owl

Reasonable and prudent alternatives (RPAs): None for Yaqui chub or for Mexican spotted owl.

Incidental take statement: Yaqui chub

Anticipated take: Take is anticipated by change in pool availability and pool volumes. Pre- and post monitoring is required.

Reasonable and prudent measures (RPMs): Three for Yaqui chub.

Terms and conditions (T&Cs): Fourteen for Yaqui chub.

Incidental take statement: MSO

Anticipated take: Incidental take for MSO is assigned to three known PACs (six birds and associated eggs/young) in the project area (North Fork Rucker #050103, Mormon Canyon #050108, and Pole Bridge #050110). In addition, incidental take is assigned for two unknown PACs in unsurveyed MSO habitat (four birds). For tallying purposes, total take of MSO (i.e., harm, harassment, mortality) for this project is 10 birds (five pair and associated eggs/young).

Reasonable and prudent measures (RPMs): Three for MSO.

Terms and conditions (T&Cs): Fifteen for MSO.

Conservation recommendations: Three for Yaqui chub and four for MSO.

United States Department of the Interior
U.S. Fish and Wildlife Service
2321 West Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951
Telephone: (602) 640-2720 FAX: (602) 640-2730

In Reply Refer To:
AESO/SE
2-21-98-F-286 November 16, 1999

Mr. John McGee, Forest Supervisor
Coronado National Forest
300 West Congress
Federal Building, 6th Floor
Tucson, Arizona 85701

Dear Mr. McGee:

This document transmits the U.S. Fish and Wildlife Service's biological opinion on the proposed Johnson Peak Fire Management Plan and its effects on the endangered Yaqui chub *(Gila purpurea)* and the threatened Mexican spotted owl *(Strix occidentalis lucida)* (MSO) in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq*.). Your May 20, 1998, biological assessment and evaluation and cover letter were received by the Service on May 27, 1998. The project is proposed for public lands administered by the Coronado National Forest, Sierra Vista Ranger District, in the Chiricahua Mountains, in Cochise County, Arizona.

Critical habitat has been designated for the Yaqui chub as "all aquatic habitat on the San Bernardino National Wildlife Refuge." The proposed action does not occur adjacent to, nor would it affect critical habitat for the Yaqui chub. Because critical habitat for the MSO has been revoked, no conferencing or consultation is required for critical habitat for this species (USFWS 1998a).

This biological opinion includes the Service's response to your May 20, 1998, request for concurrence with your findings that the proposed action may affect, but is not likely to adversely affect the endangered American peregrine falcon (*Falco peregrinus anatum*), lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*), jaguar *(Panthera onca),* and Mexican gray wolf (*Canis lupus baileyi*), for the proposed Johnson Peak Fire Management Plan. These findings are addressed under the "Concurrences" section of this biological opinion.

This biological opinion is based on information provided in the following documents:
May 20, 1998, Biological assessment and evaluation (BAE) (Gary Helbing, Biologist, Douglas Ranger District);
May 11, 1998, Environmental assessment (BA) (Douglas Ranger District);

December 8, 1997, Watershed report for the Johnson Peak Fire Management Plan (Robert Lefevre, Hydrologist, Coronado National Forest);

December 9, 1997, Watershed report for Upper Brushy Canyon of the Johnson Peak Fire Management Plan (Robert Lefevre, Hydrologist, Coronado National Forest);

Undated, Risk assessment chart for a Stage I analysis (SE Zone Dispatch, Coronado National Forest);

Undated, Draft prescribed burn plan including holding and contingency plans (Ed Encinas, Fuels Specialist, Douglas Ranger District);

Undated, Go/No Go decision tree analysis for WFRB implementation (Ed Encinas, Fuels Specialist, Douglas Ranger District);

August 17, 1998, Field meeting notes regarding the Long fire effects and the Johnson Peak Fire Management Plan (Douglas Ranger District);

September 29, 1998, Notes taken at Johnson Peak Fire Plan information meeting (Tricia Roller, Service);

September 30, 1998, Memo regarding Yaqui chub conservation measures and revised WFRB project map (Service);

September 30, 1998, Memo regarding Mexican spotted owl surveys (Service);

September 30, 1998, Electronic mail regarding agave densities and monitoring methodology,

1995, The National Wildland Fire Management Policy (U.S. Department of the Interior and the U.S. Department of Agriculture, Implementation 1998).

The following staff and individuals displayed exemplary coordination and cooperation throughout this project:

Bill Austin	Wildlife Biologist, Flagstaff Sub-office/AZ ES Field Office, USFWS
Doug Duncan	Fisheries Biologist, Tucson Sub-office/AZ ES Field Office, USFWS
Ed Encinas	Fuels Specialist, Douglas Ranger District, CNF
Larry Eppler	AFMO/Operations & Aviation, Supervisor Office, CNF
Mima Falk	Botanist, Supervisor Office, CNF
Thetis Gamberg	Wildlife Biologist, AZ Ecological Services Field Office, USFWS
Douglas Hardy	District Ranger, Douglas Ranger District, CNF
Gary Helbing	Wildlife Biologist, Douglas Ranger District, CNF
Michelle James	Wildlife Biologist, Flagstaff Sub-office/AZ ES Field Office, USFWS
Rich Kvale	Fire/Aviation Staff Officer, Supervisor Office, CNF
Bob Lefevre	Hydrologist, Supervisor Office, CNF
Bob Reed	Wildlife Biologist, AZ Ecological Services Field Office, USFWS
Tricia Roller	Botanist, Tucson Sub-office/AZ ES Field Office, USFWS
Tom Skinner	Wildlife Biologist, Supervisor Office, CNF
Josh Taiz	Wildlife Biologist, Supervisor Office, CNF
Lester Tisino	Fire Management Officer, Douglas Ranger District, CNF
Sherry Tune	Fuels Program Manager, Supervisor Office, CNF

A complete administrative record of this consultation is on file at the Arizona Ecological Services Field Office, Phoenix, Arizona.

Consultation History

Discussions between the Forest Service and the Service regarding the Johnson Peak Fire Management Plan began in September, 1997. Meeting dates and agenda topics were as follows:

September 1997, Forest Service Interdisciplinary Team meeting;

May 12-14, 1998, Field visit and helicopter flight to observe fuel loads, topography, and discuss monitoring requirements for MSO habitat at Johnson Peak Fire Plan Area, Douglas RD, Coronado National Forest; Biological Assessment and Evaluation (BAE) signed, Service received;

August 10-11, 1998, Field meeting at Johnson Peak area following 1998 Long Fire, Douglas RD, Coronado National Forest;

August 20, 1998, Meeting regarding Johnson Peak Fire Plan implementation and conservation actions for Yaqui chub, Southeastern Zone Dispatch, Coronado National Forest;

August 17, 1998, Memo written to the Forest Service. Record and copy provided to the Service. This memo was written to summarize observations of fire effects made during the August 10-11, 1998, field visit to the Johnson Peak area following the 1998 Long Fire. This fire was monitored, confined and contained under fuel and soil moisture, and weather conditions that favored fire behavior (i.e., fire intensity, spread, and percent mosaic) considered typical for the low prescription parameters for Prescribed Fire and the low prescription for Wildland Fire managed for Resource Benefit, as further described in this biological opinion;

September 29, 1998, Information meeting held to discuss specific additional information needs required by the Service for formal consultation;

September 30, 1998, Two memoranda and one revised map regarding the project area were received by the Service;

October 2, 1998, One electronic mail regarding agave distribution and monitoring design for agaves within the proposed project area were received by the Service. Formal consultation proceeded.

July 13, 1999, Letter from Service to Forest Service requesting clarification of points in BAE.

August 27, 1999, Clarification letter from Forest Service to Service regarding BAE.

October 18, 1999, Conference call between Service and Forest Service regarding effects of fire occurring in MSO 100-acre core areas.

Background

Figures 2, 3, 4, and 5 are taken from Mark Kaib's 1998 Master's Thesis (Kaib 1998) with full permission of the author. The full citation for this work is noted in the "References Cited" section of this biological opinion. All photographic illustrations provided herein were taken by Kaib, Arizona Daily Star photographers, and Jason Rech during Kaib's research in the Chiricahua Mountains of southeastern Arizona.

Madrean Montane Conifer Forest is the dominant forest type in the project area. This forest type can be further divided into the Ponderosa Pine Series and the Mixed Conifer Series. The former is found generally in lower elevations; the latter in higher elevations, canyons and north slopes in the Southwest. Douglas-fir (*Pseudotsuga menziesii*), white fir (*Abies concolor*), southwestern white pine (*Pinus strobiformis*), Gambel oak (*Quercus gambelii*) and New Mexico locust (*Robinia neomexicana*) are scattered throughout the site, typically occupying the rockier locations at the lower elevations. Riparian stringers in the planning area contain Gambel oak, New Mexico locust, Rocky Mountain maple (*Acer glabrum*), and silver-leaf oak (*Quercus hypoleucoides*), with an understory of bush rockspirea (*Holodiscus dumosa*), snowberry, (*Symphoricarpos* spp.) and Fendler ceanothus (*Ceanothus fendleri*). Herbaceous vegetation is present, but very limited under the tree canopy at higher elevations (Brown 1994).

Project area vegetation communities vary with elevation, topography, soil type, water availability, and past and present fire disturbances. Mesic, cool air drainages on the northern and western aspects of the planning area contain dense stands of Douglas-fir and white fir at the upper elevations, transforming into pine/oak at the lower elevations. Emory oak *(Quercus emoryi*) is common at the lowest elevations of the oak woodland boundary and Arizona oak (*Quercus grisea*) and netleaf oak (*Q. rugosa*) are found in stringers of Apache pine (*Pinus engelmannii*) and Chihuahua pine (*Pinus leiophylla* var. *chihuahuana*) in the drainages. Alligatorbark juniper (*Juniperus deppeana*) and Mexican pinyon pine (*Pinus cembroides*) occur in the lower end of these drainages (Brown 1994).

There is a more well-developed herbaceous component present in the oak woodland/savanna that includes muhley grasses (*Muhlenbergia* spp.) plains lovegrass (*Eragrostis intermedia*), grama grasses (*Bouteloua* spp.), and other warm season perennial grasses. On southern and warmer aspects, Arizona interior chaparral is present and interspersed within the pine/oak and oak woodland. Manzanita (*Arctostaphylos pungens*), silktassel (*Garrya wrightii*), skunkbrush (*Rhus trilobata*), and mountain mahogany (*Cercocarpus* spp.) are present in this community. The lower elevations support desert grassland, characterized by agaves (*Agave parryi, A. palmeri*), beargrass (*Nolina microcarpa*), yuccas (*Yucca baccata, Y. schottii*), sotol (*Dasylirion wheeleri*) and a variety of grass species that may include native three-awn grasses (*Aristida* spp.) and others (USFS 1998a,b). These herbaceous species, distributed throughout portions of all these communities, provide the "fine fuel" that supports fire spread across and between the differing vegetation communities (Wright and Baily 1982). Planning area elevations range from 1646 meters (5,400 feet) in the desert grassland/oak savannas along the western perimeter of the project area to 2852 meters (9,357 feet) at Monte Vista Lookout.

Description of Historical Change

Historic wildfires are detected and documented by dendrochronologists using tree-ring analysis and written historical accounts. Fire in the pine/oak riparian canyons and the pine and mixed conifer forests of southeastern Arizona appears to have been more frequent in the past than it is today. Studies suggest the same is true across plateaus, upland bajadas, and valley basins that

support oak/pinyon/juniper woodland, savanna, and desert grassland communities. The historic role of fire influenced ecological systems and facilitated a patchy mosaic pattern of vegetation and structure, including arrangement and amount of available fuels. Historic fire impacts resulted in the creation, perpetuation and maintenance of ecological systems in the sky islands of southeastern Arizona, noted for supporting a rich and diverse flora and fauna. During recent fires that occurred in various mountain ranges in southeastern Arizona, observed severe fire behavior associated with current fuel and forest stand structure indicate that decades-long fire exclusion, livestock grazing that removed fine fuel, and current forest conditions may not be aiding in the conservation of the integrity of these ecological systems (Bahre 1995).

Changes in the woodland/savanna and desert grassland vegetation communities of southeastern Arizona currently support a greater density of woody trees and shrubs than compared to the late 19th Century (Bahre 1991, Gelbach 1981, Hastings and Turner 1965, Humphrey 1958, Kruse *et al.* 1996). Van Devender (1995) found, through paleo-ecological investigations of packrat middens, that the physical structure of grasslands and woodlands have been stable over thousands of years, although changes in species composition has occurred. Studies suggest abundance and distribution of pinyon and juniper has increased in large portions of oak woodlands (Pollisco *et al.* 1995). Since the late 19th Century, desert grasslands appear to show increased abundance in woody shrubs (Bahre 1977, 1991, and 1995, and Martin 1975). With increased woody species abundance across these community types, herbaceous species biomass has likely decreased (Hayworth and McPherson 1994, McPherson and Weltzin 1998).

Human activities have influenced changes in vegetation structure and function. Livestock overgrazing, ecosystem and landscape-scale wildfire suppression, fuelwood harvesting, altered species interactions (i.e., introduced exotic plant and animal species), meteorology, and atmospheric chemistry all contribute to these changes. Other changes are fire exclusion through complete suppression actions, increased atmospheric CO^2 concentrations (this influences the relative abundance of either C^3 woody plant species or C^4 herbaceous species), and changes in annual precipitation patterns that results in less rainfall in the summer months and more rainfall in the winter months (Abbott 1997, 1998, Archer 1994a, 1994b, Bahre 1991, McPherson 1995, 1997, McPherson and Weltzin 1998).

Historic accounts of wildfire in the late 19th Century are somewhat limited. Past wildfires 1) covered larger areas than they do today (especially in semidesert grassland when native herbaceous cover was plentiful); 2) occurred in all of the major vegetation types (found across the planning area); 3) were frequent; 4) were set by Native Americans, especially Apache; 5) were suppressed by early Anglo settlers; 6) became less frequent after 1882 in large, grassland-type scenarios; and 7) were suppressed more and more in the grasslands during the 1890's, thus allowing the "brush invasion" to enter and overcome vast grassland areas (Bahre 1995). Concurrent with this was a great increase in livestock overgrazing that also contributed ecological changes resulting in the current fire situation (USFWS 1999b).

Fuel arrangements and accumulations have drastically increased since the late 19th Century due largely to human fire suppression activities. Fuel arrangement is the vertical and horizontal connectivity of fuels (limbs, leaning trees, dead and down wood, etc.). Dead woody debris (including the tree and shrub boles, branches, leaves, and decaying organic matter) accumulates on the ground, increasing fuel quantity and creating a connecting, layering effect of woody material. Smaller-sized woody fuels (thickets of shrubs, small-diameter, pole-sized trees, numbers of woody stems per acre, and dead and down material measuring less than three inches in diameter) have measurably increased compared to past conditions (Appendix B and Figure 1) (USFS 1998b, Brown 1994).

Oak and riparian canyon pine/oak woodland vegetation communities existed and still occur today between desert grasslands and savannas at lower elevations, and Chihuahua/Apache/ponderosa or mixed conifer forests at higher elevations (Figures 2 and 3). Chihuahua/Apache pine stringers occur in riparian canyons from higher to lower elevations, through oak and pinyon/juniper woodland/savanna, dense interior chaparral and desert grassland or desert shrubland communities in southeastern Arizona. Except for the more xeric desert shrubland, these communities were connected historically by a continuous herbaceous understory (Wright and Bailey 1982).

While herbaceous species composition across these communities may have varied, its role as an agent to influence fire spread as a fine fuel was relatively constant. Fires ignited in one vegetation type often spread into other types, given an adequate distribution of fine fuels to carry it. Some communities such as chaparral burned independently of fine fuel loads if the dead-to-live fuel ratio was adequate (much like today). Herbaceous fine fuel distribution still dictates current fire spread across and between many ecological systems (McPherson 1995, Wright and Bailey 1982).

Since the turn of the century, fire regimes have been altered in the mountain ranges and valley basins through land use practices and decisions influencing fire exclusion. Early descriptions of the semidesert grassland provides useful information on the past form and function of fire regime at lower elevations. In his journals from the southwest borderland Apache campaigns in the 1880's, Captain John Bourke boasted "...as for the grasses one has only to say what kind he wants, and lo! It is at his feet--from the coarse sacaton which is deadly to animals except when it is very green and tender, the dainty mesquite, the bunch, and the white and black gramma, succulent and nutritious... I must say too, that the wild grasses of Arizona always seemed to me to have but a slight root in the soil, and my observation is that the presence of herds of cattle soon tears them up and leaves the land bare" (Kaib 1998).

Fire history in the mixed conifer and pine forests and pine/oak woodlands have been described spatially across the Chiricahua Mountains and other, nearby ranges in southeastern Arizona (Kaib 1996). Madrean Montane Forests (Brown 1994) in Arizona and New Mexico prior to 1900 were estimated to experience fire once per decade, with some fire intervals as often as once every two years (Swetnam and Baisan 1996). The Ponderosa pine forest in the Huachuca Mountains showed a mean fire interval of four to eight years prior to 1870 (Danzer *et al.* 1996). The mixed

conifer forests in the Pinaleno Mountains showed fire intervals of every four to eight years (Grissino-Mayer *et al.* 1994). In the mixed conifer pine/oak woodland, Kaib (1998) estimated the mean fire interval to be every five to nine years, and in the Chiricahua Mountains, he estimated the fire interval as every four to eight years. The mean fire interval does not reflect the entire variation of fire frequencies sampled or that actually occurred. This variability is important because it reflects a pattern of fire heterogeneity and results in habitat diversity.

Abbott's review (1998) suggests a reasonable and conservative assumption would be a fire occurring every 10 to 30 years, with other factors interacting to influence the event such as physiognomy, soils, and topography. In lower elevation desert grasslands in southeastern Arizona, historic fires were estimated by various authors to have occurred at least once every decade with some fires occurring once every seven to 10 years and others occurring once every four to nine years (Abbott 1997, 1998, Kaib 1998, McPherson 1995, McPherson and Weltzin 1998). The role of fire is basic and significant in characterizing ecological systems in southeastern Arizona, especially in those ecological systems occurring above 1,067 meters (3,500 feet) in elevation.

Lightning-caused ignitions naturally occur at all elevations. Fire spread is dependant on available fuels across desert grasslands, higher elevation woodlands, and forests (Barrows 1978, Jandrey 1975). Sources for fire ignitions are unlimited, especially with the increased human use on public and private lands. Table A, below, shows 81 recently known fires which have occurred over a 17-year period and all are located in the project area. Current fuel loads at higher elevations within the mixed conifer, mixed pine, pine/oak woodlands and pine/oak riparian canyons are higher and more continuously distributed than they were historically. These increases have influenced fire intensity levels by orders of magnitude.

Table A. Summarization of Recent Fire Occurrence Records by Watershed from 1980 through 1997, Douglas Ranger District Coronado National Forest, February 1998 (Helbing 1998).

Watershed	Number of Occurrences
West Turkey Creek	9
Morse Canyon	19
Pole Bridge Canyon	2
Brushy Canyon	17
North Fork Rucker Canyon	6
Sycamore Canyon	1
Bear Canyon	4
John Long Canyon	12
Rucker Canyon	10
Total	**81**

Fuel sampling plots located in the planning area showed 20 percent of the total fuel loading (averaging 26 tons per acre) consisted of dead woody fuels less than three inches in diameter. The duff layer averaged 9.4 centimeters (3.7 inches) deep in sampled plots. Where this level is deeper, associations have been made to increased mortalities of large-sized ponderosa pine and Douglas-fir trees following fire. The steep, dissected topography and associated active nature of the associated watersheds in the conifer forests have influenced the accumulation of the duff layer (USFS 1998b).

Across most lower elevations in the planning area (including Forest Service and private ranch land), recent observations of lower watershed and range conditions have shown an increased abundance in distribution of herbaceous cover (i.e., fine fuels) (USFS 1998c). These observations are noted in recent range and watershed restoration efforts outlined in the El Coronado Ranch Habitat Conservation Plan/Environmental Assessment (USFWS 1997a). This trend is expected to continue, based on future proposed range and watershed actions (USFWS 1999b). This trend in range conditions will likely facilitate fire spread between canyons with the potential of severe fire behavior to occur within them in association with the current observed woody fuel structure.

Historic fire behavior varied from small to large fires and from low surface fires which reduced patches of understory ladder fuels, to those which supported patches of crown fire causing small pockets of change in forest stand structure (Abolt 1997). Recent wildfire behavior observed over the last 10 to 15 years in southeastern Arizona (Figure 4) and across the western states is now considered much more severe, causing larger-sized fires of greater intensities, and more continuous crown fire and less unburned mosaic.

Erosion and soil loss can be extreme after a catastrophic fire event. Acute erosion associated with the 1994 Rattlesnake fire was estimated at tens of thousands of year's worth of soil accumulation lost within a two-year period after the fire (Figure 5). Monitoring and implementing fire treatments in a conservative manner (i.e., small-scale areas, one at a time), combined with application of reviewed results to future fire treatments, are the basic foundations that guide this fire management plan.

Fuel loads in the project area, already high, have increased after decades of unnatural, human-caused impacts from fire exclusion, fire suppression, and livestock grazing. Recent fires have become severe, landscape-scale, stand-replacement fires that have caused tremendous erosion, soil damage and sterility, long habitat recovery times, and large expanses of bare ground, as occurred during the 1994 Rattlesnake and 1996 Centella fires (USFS 1998b).

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The following description of the proposed project is taken from the BAE. All table and figures are included in this biological opinion, unless otherwise noted.

A current plan describing how prescribed fire (PF) will be implemented and how and where naturally-ignited (lightning) wildland fire managed for resource benefit (WFRB) will be allowed to burn, fire location and fire prescription guidelines, and the decision process the Forest Service will use to determine whether to suppress or monitor naturally-ignited fires does not exist for the Chiricahua Mountains. The Johnson Peak Fire Management Plan proposes to address these issues and is the subject of this consultation.

The Forest Service is implementing the Federal Wildland Fire Policy and Program Review (USDA and USDI, 1995). This policy changes the names of the following terms:

OLD TERM	NEW TERM
Management Ignited Fire (MIF)	Prescribed Fire (PF)
Prescribed Natural Fire (PNF)	Wildland Fire managed for Resource Benefit (WFRB)

The Forest Service proposes using PF, and to monitor naturally-ignited (lightning) fires to possibly be allowed to burn as WFRB, in the Johnson Peak project area, located in the west-central Chiricahua Mountains in southeastern Arizona (Figure 6). This plan outlines actions the Forest Service will take and allow to occur regarding fire in the project area for a 10-year period, with annual effects and data review between the Forest Service and the Service to allow for adaptive changes in burn prescriptions based on monitoring results.

Prescribed fire (PF) is defined as fire burning under conditions specified in an approved fire management plan and ignited by Forest Service personnel. A naturally-ignited wildfire or wildland fire managed for resource benefit (WFRB) is defined as a fire ignited by lightning and burning under conditions specified in an approved fire management plan. All other human-caused fires (deliberate or accident) will be suppressed. For this consultation, the use of the fire term "blowout" is defined as fire that modifies (opens) the upper forest canopy.

Project, burn block, and treatment area boundaries were designated using existing trails, rocky outcrops, and changes in vegetation, topography and areas where, if fireline construction is absolutely necessary, the least amount of damage would result on the land (Figure 11).

The action area for the Johnson Peak Fire Management Plan involves approximately 12,950 hectares (32,000 acres) surrounding Johnson and Monte Vista Peaks located in the Chiricahua Mountains (Figures 7 and 8). This project area was chosen based on its location outside the perimeter of the 1994 Rattlesnake fire boundary and the presence of high fuel levels (Figure 7).

Project area elevations range from 1,646 meters (5,400 feet) in the desert grassland/oak woodlands of the western edge of the project area to 2,852 meters (9,357 feet) at Monte Vista Peak. See Appendix B for details of the current project area fuel loadings.

Prescribed Fire (PF)

PF is defined as fire burning under conditions specified in an approved fire management plan and ignited by Forest Service personnel. Careful use of PF is intended to reduce ladder fuels and the high fuel loads in the mixed-conifer and pine-oak areas of the project area, so future fires may more safely burn in a more natural pattern on the landscape.

The Johnson Peak project area is divided into nine burn blocks (Figure 8). PF ignitions are only planned to occur in three burn blocks. They are 1) Johnson Peak, 2) Morse Canyon and 3) Pole Bridge (Figure 9). These burn blocks are roughly 809 hectares (2,000 acres) each and contain MSO protected, restricted and other habitats, as defined in the MSO Recovery Plan (Figure 10).

Portions of three designated MSO Protected Activity Centers (PACs) will be impacted by PF. These PACs are North Fork Rucker (#050103), Mormon Canyon (#050108), and Pole Bridge (#051010). PF will be applied during the winter months of November, December and January, which are outside the MSO breeding season (March 1 to August 31, annually) and retain the highest fuels moisture.

The Forest Service is committed to keeping PF out of the designated 100-acre core areas that surround a nest/roost site as much as possible. The District Wildlife Biologist will be working closely with the Burn Boss and/or Fire Boss and their crews, and the most recent MSO information for each PAC will be used prior to any fire entry in a PAC.

PF will be introduced in incremental phases within each burn block. The acreage treated will vary and may be as small as two hectares or as large as 101 hectares (five to 250 acres), depending on a variety of factors and conditions such as fuel load, vegetation and habitat types, accessibility, topography, planning logistics, burning conditions, funding, personnel, and resource availability.

One burn block at a time will be treated with PF until each block has been satisfactorily treated to meet prescribed fire objectives as detailed in the biological assessment. Total acreage of these three burn blocks is roughly 6,475 hectares (6,000 acres). The remaining project area acreage of 10,522 hectares (approximately 26,000 acres) is designated specifically for WFRB management only (see the WFRB section).

Phase I applies to the low PF treatment scheduled for a treatment area of approximately 81 hectares (200 acres) located within burn block number 1) Johnson Peak, in the upper watershed of Brushy Canyon, beginning in November 1999 and no later than January 2000. Given burning conditions and project logistics, future annual treatments (following phases as yet unnumbered)

will most likely involve PF applied to areas ranging from 2 hectares to 101 hectares (five to 250 acres) of prescribed fire in burn block 1) Johnson Peak. Per further clarification by Forest Service letter dated August 27, 1999, 101 hectares (250 acres) is not an upper limit to PF treatments in the burn blocks, but given budget and personnel constraints, completing this many acres annually is considered by the Forest Service to be very unlikely.

The MSO Recovery Plan notes all MSO nest/roost sites must be identified prior to implementing PF in any MSO PAC. The Forest Service has information to suggest the likeliest areas for nest/roost sites, but after limited surveying and monitoring, no nests have been found. The rugged, steep terrain and the wilderness in which much of the proposed project area lies makes MSO surveys very difficult and unsafe to conduct during nighttime hours, when MSO auditory responses are likeliest to occur. Using the best available information and personal knowledge of the three PACs partially included in the project area, the District Wildlife Biologist has designated a 100-acre core area in each one. Each core area surrounds the likeliest nest/roost site in each PAC.

In implementing PF in a PAC, different fire ignition methods and ignition locations can be applied that will aid in keeping fire out of the 100-acre core areas. No ignitions will occur directly on down materials. No ignitions or headfires will be applied downslope (below) of any 100-acres core area in any PAC.

Ignition strategies resulting in a "backing" fire will be used, but fire itself will not be maneuvered through a 100-acre core area. A "backing" fire uses ignitions placed along a slope's contour, just below the top of a control feature (ridgeline, road, etc.). This first strip is allowed to burn upslope to the control line, where it then goes out. This provides the first "blackline" buffer strip that will hold the next strip of fire. The next narrow strip of slope is ignited below the first (which is now blackline). The fire burns uphill and goes out as it backs up into the previously-burnt strip. This allows for greater control of fire flame length, intensities, and rate of fire spread.

The MSO Recovery Plan defines a large down log as measuring greater than 31 centimeters (12 inches) diameter midpoint. PF is expected to scorch and/or burn some down logs in this size range when burning in PACs, especially much older, rotted (punky) down logs which are considered more susceptible to fire than newer, fresher down logs.

Before PF treatment in PACs, pre-treatment measures will be applied to live trees and snags greater than 61 centimeters (24 inches) dbh. Crews will rake ground fuels and duff from around the base of these standing components, and also will remove ground litter and duff from around down logs greater than 61 centimeters (24 inches) diameter midpoint. Where there is a deficiency of down logs of 24 inches or greater at midpoint diameter, the largest-sized available logs will be raked where possible.

Vegetation habitat in treatment areas will be monitored pre- and post-PF treatments. PF areas in MSO PACs will be monitored using the Forest Service-approved MSO microhabitat monitoring protocol. The Forest Service will conduct pre-fire and immediate post-fire observations for PF. Monitoring results and data will be analyzed and applied to all burn blocks and PF will be tailored for each specific burn block and situation. Baseline fuel inventory sample data will be collected (using the "Photo Series for Quantifying Forest Residues in Southwestern Region" procedures) prior to each burning cycle. Post-burn evaluations will use the same guide and data collected will be comparable to pre-burn data.

The low prescription parameters for PF are:

1. a low intensity fire;
2. flame lengths no greater than 1.21 meters (four feet);
3. maximum daytime temperatures no higher than 69 degrees Fahrenheit (at Monte Vista Peak Lookout);
4. minimum daytime temperatures no lower than 10 degrees Fahrenheit (at Monte Vista Peak Lookout);
5. minimum daytime relative humidity not less than 15 percent;
6. minimum one-hour fuels dead fuel moisture level at 6 percent; and that
7. moisture for 1,000 hour fuels are not to fall below 15 percent in mixed-conifer, 12 percent in pine-oak, and nine percent in other vegetation type, and are preferred to be in the range of 17 to 18 percent when circumstances permit.

The objective for PF are:

1. to reduce 1 hr fuels (0.01 to 025 inch diameter) by 30 to 80 percent;
2. to reduce 10 hr fuels (0.26 to 0.99 inch diameter) by 10 to 40 percent;
3. to reduce 100 hour fuels (1.0 to 3.0 inch diameter) by 1 to 10 percent;
4. to retain almost all 1,000 hour fuels (greater than 3.0 inches diameter); and
5. to keep flame length to 1.21 meters (four feet) or less.

PF ignitions will be restricted to burn blocks 1, 2, and 3 only (Figure 9). These three burn blocks contain areas of mixed conifer and were chosen for PF because they contain the highest fuel loads and are at the highest risk for catastrophic wildfire. The Forest Service proposes to allow PF to continue to burn outside those boundaries only if fire intensities remain in the low prescription.

After PF has been implemented in these burn blocks, the Forest Service proposes to conduct maintenance burns every four to seven years to maintain desired (reduced) fuel loads. A future schedule of these maintenance burns will be provided to the Service as soon as they are designed and funded by the Forest Service.

PF ignitions will not occur within 61 meters (200 feet) of any drainage deemed sensitive by the District Wildlife Biologist. This restriction will provide a buffer zone to help prevent ash influx and sediment transport to the stream (which can impact Yaqui chub, should moderate or heavy

rains occur immediately after PF has been implemented in the area). Figure 8 shows designated burn blocks and the one mile buffer zone in place to protect the Yaqui chub from PF effects.

As the Forest Service accumulates and applies data to these three burn blocks, and implements and demonstrates monitoring results, it is possible the agency may wish to implement future fire prescriptions that would allow for higher intensities and greater acreage to be treated. Annual monitoring results and data review by both agencies will aid these efforts. Based on monitoring results, if the Forest Service determines future fire parameters could be modified upward beyond those covered within the context of the Forest Service biological evaluation and assessment (BAE), the Johnson Peak Fire Management Plan, the Johnson Peak Burn Plan, the Johnson Peak Test Burn Report (Appendix A), and this biological opinion, then further consultation with the Service will be conducted and amendments to this biological opinion will be considered.

Wildland Fire managed for Resource Benefit (WFRB)

Any naturally-ignited (lightning) fire is immediately assessed by the Forest Service and is assigned an Incident Commander. The Incident Commander, after appropriate assessment and data from qualified personnel, may decide to manage the fire as WFRB, continuing to closely monitor the fire and ensuring it burns within specific, defined fire prescription parameters established for WFRB (Table A). In the event that the fire exceeds or is expected to exceed fire prescription parameters within the next burning period (the ensuring 24-hour assessment window the Forest Service monitors for fire), the Incident Commander will declare the fire a wildfire and begin suppression operations.

The Forest Service proposes the following prescriptions for WFRB to be implemented in different areas of the project area; they are based on the predominant vegetation type in each area.

Table A. Fire prescriptions for WFRB <u>outside</u> MSO protected and restricted habitat. Johnson Peak Fire Management Area, Douglas Ranger District, Coronado National Forest, 1998. (Baseline parameters are set for the 9,357-foot elevation above Mean Sea Level at Monte Vista Lookout, the highest point in the planning area. Prescription data for any site-specific ignitions at lower elevations will be evaluated relative to data collected at Monte Vista Lookout).

	Low Prescription for mixed conifer	**Moderate Prescription for pine/oak**	**Significant Prescription for other vegetation type**
Fire Condition Variable			
Flame length (ft)	0.5 - 4.0	3.0 - 7.0	6.0 - 12.0
Relative Humidity(%)	40 - 100	25 - 50	20 - 45

Temperature (F)	40 - 60	50 - 70	60 - 80
20 foot wind speed (mph)	0 - 10	0 - 20	0 - 30
1,000 hour fuel moisture minimums (percent)	15	12	9

While this plan does not intend to ignite PF in the same areas WFRB has already occurred, it is possible WFRB may be allowed to burn in areas already treated by PF. Flexibility in fire management under WFRB will account for re-occurring fire activity in the same areas during the same year.

In MSO PACs, the Forest Service has committed to keeping the first entry of WFRB at the low prescription as described above. After the October 18, 1999, conference call between the Forest Service and the Service, it was agreed that the moderate and significant prescriptions for WFRB would not be allowed in MSO PACs unless prescribed fire or the low prescription for WFRB had occurred in the PAC as a first entry. After scheduled annual review of fire effects and fire monitoring results, amendments to this biological opinion may allow for future WFRB entries into PACs at different prescriptions (moderate or significant).

The Burn Boss' decision to designate, monitor and manage a WFRB ignition will be influenced by factors such as Forest Service regional fire preparedness levels, current and predicted weather conditions, availability of fire management resources, locally-observed fuel conditions, general burning conditions, predicted fire behavior, and fire location and intensity.

In a worse-case scenario, a naturally-ignited (lightning) fire will start in an area not previously treated with prescribed fire. Fuel levels will be unnaturally high and a natural ignition fire would be expected to burn in an uncontrolled and catastrophic manner with severe, negative impacts to wildlife and habitat. In a best-case scenario, a naturally-ignited (lightning) fire will start in an area previously treated by prescribed fire. Fuel levels will be lower (than before prescribed fire treatment), and a natural ignition fire would be expected to burn with lessened impacts to wildlife and habitat.

The Forest Service proposes to use a Remote Access Weather Station, Type II, for retrieval of spot weather data from Monte Vista Lookout, the highest elevation in the planning area. Data will be collected, available and obtainable during any fire activities to provide the most reliable weather data available. This information is essential for modeling potential future fire behavior on a 24- to 72-hour basis. Data will be available for use with on-the-fire weather observations (collected with a belt weather kit) for fire specialists to assess and predict fire behavior for the ensuing 24- and 72-hour intervals for any fire.

All WFRB will be reviewed and documented daily to ensure fire behavior remains within prescription parameters for the ensuing 24-hour burning period (given reasonably foreseeable weather conditions and predicted fire behavior). The 24-hour period is the "burning period" for fire assessment. At a minimum, one qualified Resource Advisor and one Prescription Burn Monitoring Specialist or a Red-Carded Fire Observer will be on site and monitor WFRB for effects to federally-listed species and their habitats. Other personnel may include the District Wildlife Biologist or Forest Staff Wildlife Biologist.

Should daily review and monitoring indicate WFRB will, or is expected to exceed fire prescription parameters within the ensuing 24-hour period, (the designated next "burning period), that WFRB will be declared an escaped wildfire and suppression and management decisions will be the responsibility of the designated Incident Commander.

Should WFRB threaten or enter federally-listed threatened and endangered species' habitat, the Forest Service will re-assess the fire's prescription parameters. If the fire remains in appropriate prescription, the Forest Service may decide to allow the fire to continue to burn. If the fire is not in prescription (based on habitat type and other fire parameters), the Forest Service will immediately notify the Service of a wildfire situation, and suppression and management decisions will be the responsibility of the designated Incident Commander.

Fire management decisions will be made by the Incident Commander, on a site-specific, case-by-case basis, given all other parameters including, but not limited to, human life and safety, property, least-damaging operations to wildlife, plants, and habitat, firefighting resource availability, cost effectiveness, wildlife and natural resource protection objectives, and other factors. Any fire suppression activities would become an emergency consultation with the Service, which would go into effect the moment the Forest Service made the fire management decision that the WFRB was an escaped wildfire and immediately notified the Service.

The Forest Service will conduct immediate post-fire observations for WFRB. This will entail a qualitative walk-through, with photographic documentation, at established photo points. Specific fire-related variables (i.e. weather, fuels, fire behavior, smoke, and post-fire consumption patterns) shall be documented, and any other data and analysis will be included. Monitoring results and data will be analyzed and incorporated into following WFRB events, as necessary. The Forest Service may include quantitative post-fire observations for WFRB that include ground review of on-going burning by a qualified Prescribed Fire Behavior Monitor or a Red-Carded Fire Observer, a qualified Resource Advisor, and the Burn Boss and/or Fire Boss.

STATUS OF THE SPECIES

Yaqui chub

The Yaqui chub was listed as endangered on August 31, 1984. Critical habitat was designated for this species as "all aquatic habitat on the San Bernardino National Wildlife Refuge (SBNWR)

(USFWS 1984)." Because this was prior to the acquisition of Leslie Canyon, Leslie Canyon is not part of the designated critical habitat. The Yaqui chub is a medium-sized fish of the family Cyprinidae (Minckley 1973). Until recently, Yaqui chub was thought to occur in the basins of the Rios Sonora, Matape, and Yaqui in Arizona and Sonora, Mexico (Hendrickson *et al.* 1980). In 1991, the chub that occurred in the Rios Sonora and Matape and the Rio Yaqui system downstream from San Bernardino Creek was recognized as a different species and designated *Gila eremica* (DeMarais 1991).

The Yaqui chub is endemic to San Bernardino Creek in Arizona and Mexico and possibly the Willcox Playa basin in Arizona (DeMarais 1991, Varela-Romero *et al.* 1990). It currently occurs in Bathhouse Spring, Black Draw, House Pond, Mesquite Pond, North Pond, Oasis Pond, Robertson Cienega, Twin Pond, and Two PhD Ponds on the San Bernardino NWR (USFWS 1994). Only a few individual chub were caught in Robertson Cienega during the 1994 monitoring effort. Some of those populations have been stocked into enhanced or artificially created habitats as part of the recovery program. The population in Leslie Creek was stocked in 1969 with individuals taken from Astin Spring (Minckley and Brooks 1985). A population in Turkey Creek in the Chiricahua Mountains was stocked in 1986 and 1991 from Astin Spring (via Leslie Creek) stock raised at Dexter National Fish Hatchery.

El Coronado Ranch is a combination of private and leased lands which are subject to livestock grazing. Over the past several years the rancher/owner of the private land has restored the ranch and made improvements to the watershed and rangelands, enhancing livestock production and ecosystem health. A Coordinated Land Management Plan for the El Coronado Ranch was completed in 1993 (USFS 1993). This included livestock management on both the private and Forest lands. The plan specifies livestock use, management systems, range improvements, and plan evaluation. For further details regarding the environmental baseline across this ranch and the Forest Service allotment, see the Environmental Assessment and the El Coronado Ranch Habitat Conservation Plan (USFWS 1997a).

Non-indigenous fishes, including rainbow trout (*Oncorhynchus mykiss*), fathead minnow (*Pimephales promelas*), channel catfish (*Ictalurus punctatus*), western mosquitofish (*Gambusia affinis*), green and bluegill sunfish (*Lepomis cyanellus* and *Lepomis macrochirus*) and largemouth bass (*Micropterus salmoides*), two amphibians (the bullfrog, *Rana catesbeiana*, and the tiger salamander, *Ambystoma tigrinum*), and various crayfish have appeared or increased in numbers and distribution from pre-existing populations. These organisms can negatively impact native aquatic species. Some work has been directed toward control or removal of these organisms on the El Coronado Ranch and more effort will be necessary. However, the applicant may stock the lowermost pond with non-native, non-reproductive game fish, probably trout. The fish would exist for limited, private, recreational fishing. A barrier on the pond inlet will prevent exotic fish from moving upstream and slow the potential movement of listed fish into the pond. A barrier on the pond outlet will minimize fish movement out of the pond. Having non-native fish in the aquatic system may result in take of federally-listed species of fish (USFWS 1997a).

Mexican spotted owl (*Strix occidentalis lucida*)

The Mexican spotted owl (MSO) was listed as threatened on March 16, 1993 (USFWS 1993). Critical habitat was designated for the species on June 6, 1995 (USFWS 1995c), but was later withdrawn (USFWS 1998a). The Mexican spotted owl was originally described from a specimen collected at Mount Tancitaro, Michoacan, Mexico, and named *Syrnium occidentale lucidum*. The genus was later changed to *Strix* and specific and subspecific names were changed to conform to taxonomic standards; the subspecies became *S. o. lucida*. The American Ornithologists' Union currently recognizes three spotted owl subspecies; the California, *S. o. occidentalis*; Mexican, *S. o. lucida*; and Northern, *S. o. caurina*.

The Mexican spotted owl has the largest geographic range of the three subspecies. That range extends from the southern Rocky Mountains in Colorado and the Colorado Plateau in southern Utah, southward through Arizona and New Mexico, and discontinuously through the Sierra Madre Occidental and Oriental to the mountains at the southern end of the Mexican Plateau. This range is divided into six Recovery Units (RUs) in the United States and five in Mexico. The project area is in the Basin and Range-West RU. See the MSO Recovery Plan (1995) for a detailed description of this RU.

MSO nest, roost, forage, and disperse in a diverse array of biotic communities. Nesting habitat is typically in areas with complex forest structure or rocky canyons, and contains mature or old-growth stands which are uneven-aged, multi-storied, and have high canopy closure (Ganey and Balda 1989, USFWS 1991). Mixed-conifer forests are commonly used throughout most of its range (Ganey *et al.* 1991). Dominant and codominant trees of the main canopy are often 30 to 45 centimeters (12 to 18 inches) diameter breast height (dbh) or greater in the mature and old forest types. Douglas-fir is the most commonly used tree species for nesting (Fletcher and Hollis 1994). Codominant tree species include southwestern white pine (*Pinus strobiformis*), white fir (*Abies concolor*), limber pine (*Pinus flexilis*), and ponderosa pine (*Pinus ponderosa*). A wider variety of tree species is used for roosting. The understory often contains the above coniferous species plus broadleaf species such as Gambel oak, maples and box elder (*Acer* spp.), or New Mexico locust (Brown 1994).

In southern Arizona, Madrean pine-oak dominated forests are also commonly used (Ganey and Balda 1989, Duncan and Taiz 1992). These forests are typically characterized by an overstory of Chihuahua (*Pinus leiophylla*) and Apache (*P. engelmannii*) pines with species such as Douglas-fir, ponderosa pine, and Arizona cypress (*Cupressus arizonica*). Evergreen oaks (*Quercus* spp.) are often in the understory (Brown 1994).

Besides forested areas, Mexican spotted owls inhabit a variety of canyons. These canyons vary from those with a high degree of forested structure (coniferous or hardwood riparian woodlands) to those with little or no tree cover being present. The common characteristic among these canyons is steep to vertical rock walls in all or part of the canyon. These canyons often are used extensively when available. Rock-walled canyons generally are found at elevations below 2,286

meters (7,500 feet) above seas level and are occupied by owls as low as 1,128 meters (3,700 feet) (Ganey and Balda 1989).

Mexican spotted owls consume a variety of prey throughout their range but commonly eat small and medium-sized rodents such as woodrats (*Neotoma* spp.), peromyscid mice, and microtine voles. They may also consume bats, birds, reptiles, and arthropods (Ward and Block 1995). Habitat correlates of the owl's common prey emphasizes that each prey species uses a unique microhabitat. Deer mice (*Peromyscus maniculatus*) are ubiquitous in distribution in comparison to brush mice (*Peromyscus boylei*) which are restricted to drier, rockier substrates, with sparse tree cover. Mexican woodrats (*N. mexicana*) are typically found in areas with considerable shrub or understory tree cover and high log volumes or rocky outcrops. Mexican voles (*Microtus mexicanus*) are associated with high herbaceous cover, primarily grasses. In contrast, long-tailed voles (*M. longicaudus*) are found in dense herbaceous cover, primarily forbs, with many shrubs but limited tree cover. A diverse prey base is dependant on the availability and quality of diverse habitats (USFWS 1995b).

The MSO Recovery Plan provides for three levels of habitat management: protected areas, restricted areas, and other forest and woodland types. "Protected habitat" includes all known owl sites, and all areas in mixed conifer or pine-oak forests with slopes greater than 40 percent where timber harvest has not occurred in the past 20 years, and all reserved lands. "Protected Activity Centers" (PACs) are delineated around known Mexican spotted owl sites. A typical MSO PAC includes a minimum of 243 hectares (600 acres) designed to include the best nesting and roosting habitat in the area. The recommended size for a PAC is anticipated to include approximately 75 percent of the foraging area of a Mexican spotted owl. "Restricted habitat" includes mixed conifer forest, pine-oak forest, and riparian areas; the recovery plan provides less specific management guidelines for these areas. The recovery plan does not provide owl-specific management guidelines for “other” habitat (USFWS 1995b).

A total of 214 projects have been formally consulted on in Arizona and New Mexico since August, 1993. These include projects in which incidental take of MSO was anticipated. Those projects have resulted in the total anticipated incidental take of 163 + MSO. Actual take (that take which is tallied by the Service) is likely less, but is very difficult, if even possible, to quantify. Various action agencies who have consulted on MSO include the Forest Service, the Bureau of Indian Affairs, the Federal Highway Administration, the Departments of the Air Force and Navy, National Monuments, and National Parks. In addition, upper thresholds for incidental take were provided for the Kachina Peaks Wilderness and the Kaibab National Forest Prescribed Natural Fire plans. This incidental take due to these plans will be tallied if and when it occurs, and is therefore not included in the cumulative take numbers.

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 to provide a platform to assess the effects of the action now under consultation.

Yaqui chub in the action area

One known historic record exists for Yaqui chub in West Turkey Creek; however, the specimens' identity cannot be confirmed because they were lost in the 1906 San Francisco, California earthquake (USFWS 1995a). Yaqui chub were released onto El Coronado Ranch in 1986. The fish stock was originally from Astin Spring (via Leslie Creek). Yaqui chub eventually dispersed from the ranch ponds into West Turkey Creek. The ranch ponds function as a refugium and a population source of Yaqui chub for West Turkey Creek. The population within both the El Coronado Ranch ponds and Turkey Creek drainage declined sharply following the 1994 Rattlesnake fire, nearly to the point of complete extirpation. Currently, some species of non-native fishes are beginning to re-establish themselves within both the ranch ponds and West Turkey Creek. Current Yaqui chub status within both areas show continued survival, reproduction, and recovery. The proposed creek renovation project is expected to aid in reducing the threat of non-native fishes within the project area.

The 1994 Rattlesnake fire in the upper watershed of the Chiricahua Mountains resulted in massive ash, soot, and sediment runoff during the ensuing summer rains. This almost eliminated fishes and most aquatic organisms from the stream and ponds. Ash and other accumulations required immediate removal and maintenance of ponds from which fishes had already been eliminated. Native fishes that re-invaded from unidentified refugia, along with some non-indigenous species, are currently repopulating Turkey Creek, El Coronado Ponds, and connecting waterways. It currently appears some non-native species such as trout were eliminated from the stream following the wildfire.

To aid in the recovery of the Yaqui chub, the Forest Service has initiated formal consultation on a project to renovate the Turkey Creek by reducing and/or renovating non-indigenous fish species. The Forest Service has initiated formal consultation for the continued issuance of permits to allow ongoing grazing within the West Turkey Creek sub-watersheds which drain into occupied habitat. Currently, grazing activities occur across the uplands, predominately during the fall and winter months and are not permitted along the Turkey Creek drainage during the spring and summer months. Allotment condition is rated by the Forest Service as showing an upward trend with the majority of the allotment having scored within satisfactory conditions.

Other activities within the action area on public lands may affect the chub and/or chub habitat. Forest Service Road 42 parallels the drainage for approximately three miles and several recreational summer homes and private in-holdings exist along the drainage bottom which affect water quality and other important habitat variables. These activities are subject to formal consultation.

Diversity in aquatic habitats is much lower than diversity found in terrestrial habitats. Bedrock near the soil surface promotes rapid rainfall runoff with little groundwater storage. Most drainage channels are ephemeral and the main reach of West Turkey Creek becomes intermittent during droughts that predominate between the typical, bi-seasonal periods of precipitation (winter and late summer). As in the past, water is a scarce commodity and aquatic systems are in jeopardy from any major development such as increased recreation or groundwater pumping. Introductions of non-indigenous aquatic species currently impact natural aquatic communities throughout the region and are expected to intensify as development continues.

Excepting the few seeps in tributaries and on hillsides, the only natural surface waters on the ranch are in West Turkey Creek. Base-flow varies from an estimated 0.15-0.35 m^3/min during spring and autumn drought, declining to a few liters/mm if drought is prolonged. About 6.5 kilometers of wet channel persists on and upstream from El Coronado Ranch deeded land. The downstream flow is typically intermittent in most summers, but the creek responds quickly to summer rains. Following the Rattlesnake fire, peak discharges (estimated from debris heights along the channel) exceeded 500 m^3/min. At base-flow, the creek averages less than 0.5 meters wide and 0.2 meters deep except in occasional pools that may be one to two meters wide, up to 10 meters long, and perhaps one meter deep. The largest pools are located upstream from existing water diversions on private ranch land.

Watershed storage (availability of water) has been enhanced through watershed and riparian management and maintenance and development of aquatic habitats. Wetlands and high water tables within West Turkey Creek terraces are now maintained in part by seepage from ditches and ponds, increasing reliability of portions of creek during drought.

MSO in the action area

The project area is located in the Chiricahua Mountains, in the MSO Recovery Unit (RU) named the Basin and Range-West (See the MSO Recovery Plan for a detailed description of this RU (Volume I, Part II, page 46). The Chiricahua Wilderness makes up the upper-elevational half of the project area. It contains an unknown number of acres of MSO restricted habitat which remains unsurveyed due to the steep ruggedness and difficult access to the wilderness area which prevents safe MSO surveying.

Approximately half of three MSO PACs are located in the Johnson Peak project area. They are North Fork Rucker (#050103), Mormon Canyon (#050108), and Pole Bridge (#050110). MSO PACs in the project area were created and based upon MSO auditory information collected in 1985 and aerial photographic interpretation. Monitoring since that time has located MSO in the same areas where PACs have been established. The listed areas within the project area have been surveyed as follows:

North Fork Rucker:

1990: North Fork Rucker PAC established.
1996: Forest Service surveys resulted in no MSO responses.
1997: Forest Service surveys resulted in auditory detections of one MSO pair on two separate occasions, in same location as in 1990. North Fork Rucker PAC maintained.

Mormon Canyon:

1985: Mormon Canyon PAC established (one pair).
1992: Surveys in upper watershed of West Turkey Creek via SWCA, Inc. contract. One male, one female MSO detected in same location as pair from 1985. Mormon Canyon PAC maintained.

Pole Bridge:

1990: Pole Bridge PAC established
1997: Formal surveys in Pole Bridge area resulted in no auditory MSO responses.

MSO reproductive success in designated MSO PACs in the Chiricahua Mountains was formally monitored on several occasions using Forest Service-approved monitoring protocols. The results were as follows:

1. The Mormon Canyon PAC was monitored by researchers from the Forest Service Rocky Mountain Range and Experiment Station, Flagstaff, Arizona, for 1997 only. Results confirmed one MSO pair present, but they were not exhibiting nesting behavior. Because MSO were located in the same area in 1985, the 1997 findings suggest this area is an important roosting site.

2. The Pole Bridge PAC was informally monitored on two occasions in 1997 by qualified Forest Service personnel, resulting in no MSO auditory responses to taped calls and no visual observations of MSO.

While thorough MSO surveys have not been conducted in the entire planning area, there is information to suggest the possible location of probable nest/roost sites for each of the three known MSO PACs involved in the project area. The District Wildlife Biologist has designated approximately 100-acre core areas based on this information and the topographic features in these three PACs.

The Forest Service clarification letter (USFS 1999a) provides the breakdown of vegetation types in protected and restricted MSO habitats, shown below in Table D.

Table D. MSO analysis: Proposed Johnson Peak Fire Management Plan, July 1999.

Vegetation type*	9a	9bc	9d	11a	11b	6	7	**Totals**
PROTECTED								
PAC acres	755	140	42	236	0	252	144	1,569
Reserve Acres	5,191	35		385	399	8,269	257	14,536
Slope >/=40%	100							100
RESTRICTED	234			492	1,483			2,209
TOTALS	6,280	175	42	1,113	1,882	8,521	401	18,414

* 9a=Transition Conifer Forest (pine-oak); 9bc=Mixed Conifer; 9d=Spruce fir; 11a=Deciduous Riparian; 11b=Evergreen Riparian; 6=Evergreen/broadleaf woodland; 7=Coniferous woodland.

EFFECTS OF THE PROPOSED ACTION

Yaqui chub

After the catastrophic 1990 Dude fire, subsequent flooding was found to dramatically affect water quality, macroinvertebrates, and fish populations. Fish stocked after the floods grew more rapidly than normal (Rinne and Medina 1992). The most important post-wildfire effects involve sediment movement and the most important toxicity concern is increased pulses of nitrates. Nutrients contributed from fires are phosphoric in nature (from ash) and nitrogen and ammonia (from smoke). Ammonia is toxic to fish. The absorption of smoke and nitrogen into the water depends on how long the smoke lingers near the water. In addition, incomplete combustion of materials creates charcoal. Charcoal in water leads to de-oxygenation. Minshall *et al.* (1989) found small temperature changes in shallow ponds and small steams located in severe wildfire areas within coniferous systems (including the Yellowstone fires). They concluded the impact of fire on streams varies proportionally with the intensity and extent of fire behavior including spread within a given watershed and the vegetation/fuel type being consumed.

After the 1994 Rattlesnake fire, severe, large-scale, stand-altering fire behavior occurred with subsequent extremes in soil runoff on a landscape-scale, acute erosion, and heavy sedimentation in deep pools important for survival of Yaqui chub, as well as sharp population declines of all fish normally found in West Turkey Creek in the Chiricahua Mountains. West Turkey Creek and

contributing tributaries support a substantial portion of the entire range of Yaqui chub. Severe watershed degradation and large-scale population declines from stochastic events like catastrophic wildfire constitutes one of the most significant threats to its continued survival and recovery.

While less severe than wildfire, prescribed fire can lead to results of increased sediment yield in streams and creeks, increased flood intensity, and water chemistry changes. West Turkey Creek could experience these changes. Loss of vegetation to prescribed fire and other impacts (erosion, slumping) is generally expected to lead to increased water runoff and increased sediment yield, especially during the first two years before vegetation recovers or ground litter accumulates on soils (Minshall *et al.* 1989, Pase and Granfelt 1977). Pase and Granfelt (1977) noted early establishment of grass cover and conservative management practices improved soil stability. Sediment yields were lower on slopes with moderate grades. Increased water runoff and increased sediment yield lead to changes in water chemistry (Spencer and Hauer 1991, Tiedmann *et al.* 1979) that can have negative impacts to native fishes. Dan Robinett (pers. comm. 1996) has recommended resting burned sites above 1.23 kilometers (4,000 feet) in elevation) from grazing for two years to aid in vegetation recovery.

Within the upper West Turkey Creek watershed (which includes Morse, Mormon and Pole Bridge canyons), approximately 8.09 to 12.14 hectares (2,500 to 3,000 acres) are proposed for PF treatment. Approximately another 6.07 hectares (1,500 acres) in this watershed could experience WFRB during the life of this plan. PF will occur during November, December, and January, annually, and WFRB could be expected to occur from late June to late August, annually, anywhere in the project area, including the West Turkey Creek watershed.

This fire management plan is intended to use fire in small-sized (5 to 250 acres) areas when treating a watershed. PF and WFRB will be managed and implemented under the prescriptions that are intended to result in a relatively large, unburned mosaic pattern, and will be closely monitored to decrease impacts and increase the plan's reliability. Long-term effects of successful implementation are anticipated to improve downstream riparian conditions. The likelihood of large, stand-altering fire events across the upper watershed is expected to decrease, resulting in decreased severe impacts associated with wildfire to creeks and streams. Fire is variable and some relatively minor adverse impacts (temporary increased flooding, some erosion, and minor siltation of canyon bottoms) are anticipated to affect watersheds that contribute to the waters hosting Yaqui chub.

Due to the southwest and western aspects of the project area, winds are anticipated to push and lift smoke up out the watershed and canyons towards the San Simon Valley, and are not expected to settle in any canyons. Monitoring personnel will be posted at designated vantage points to track anticipated fire and smoke effects occurring per the Arizona Department of Environmental Quality (ADEQ) smoke permit and the PF and WFRB burn plans and prescriptions. The District Wildlife Biologist and/or the Resource Advisor, the Fire Monitor(s) or Fire Observer(s), and the PF specialist will collaborate on evaluating smoke and fire effects of WFRB decisions versus fire

suppression decisions, should such a decision be necessary in the course of fire operations. No significant increases in water temperature should result from anticipated fire behavior within the context of the Johnson Peak Fire Management Plan.

Extrapolation from data collected on other *Gila* species leads to the conclusion that *Gila purpurea* may have relatively broad habitat tolerances. Yaqui chub prefer deep pool habitats (USFWS 1995a), which are an important component and long-term plan goal for species survival and recovery. Insignificant water quality changes are anticipated to occur from the proposed action and are not expected to exceed the species' tolerance for change.

The majority of the upper watershed contributing to the Turkey Creek populations of the Yaqui chub is not available to livestock grazing. The smaller portion which is grazed exists within the Turkey Creek allotment, which has recently been described as having a majority within "satisfactory" soil condition classifications (USFS 1999b). This allotment will likely continue to achieve stable watershed conditions as well as increased trends in range condition due to recent restoration and management actions developed in the Service's 1999 biological opinion on grazing for the Coronado National Forest (USFWS 1999b), and the Habitat Conservation Plan for the El Coronado Ranch (USFWS 1997a).

Fire effects to Yaqui chub can be variable. The Forest Service will implement all fire in a way that will minimize and mitigate direct and indirect impacts (e.g., harm, mortality, changes in water quality, changes in streamside vegetation cover, etc.), that are expected to be short-term. This will aid in creating and maintaining vegetation habitat communities in a mosaic pattern on a landscape scale. This vegetation pattern is more resistant and resilient to wildfire impacts. This plan will aid in minimizing catastrophic wildfire in the watershed, thus decreasing excessive watershed degradation, heavy sedimentation, and channel erosion that is often the result of severe wildfire behavior. Water quality variables such as pH, turbidity, and dissolved oxygen are altered by wildfire impacts and the severity of effects depends on the severity of the fire. Degradation of habitat variables important for the survival and recovery of the Yaqui chub are anticipated to be strongly minimized by the Forest Service's application of this plan, as it promotes use of small-sized, "cooler" fire, and prudent and controlled use of fire across the upper watersheds for the streams and tributaries that support this species.

PF is not expected to occur within 200 feet of West Turkey Creek. WFRB may burn into this buffer zone and impact the creekside vegetation, thus allowing for chances of increased sediment deposition after rain occurs. In addition, WFRB can increase erosion in the upper watershed for West Turkey Creek, particularly at moderate and significant prescriptions.

Mexican spotted owl

The MSO Recovery Plan (USFWS 1995) recognizes catastrophic fire as the greatest threat to MSO habitat. There are consequences associated with the use of PF and WFRB in MSO habitat.

PF Effects

As described in this fire management plan, PF is designed so fire will not exceed designated parameters as described above; it is not expected to burn in an uncontrolled manner nor is it expected to become any kind of a crown fire. A crown fire can quickly consume vast tracts of forested habitat. After a large crown fire, habitat components for MSO nesting, roosting, and foraging are reduced or eliminated, and tremendous erosion and silt and ash loading occurs in streams, especially if rain occurs soon afterwards. This scenario results in severe ecological and landscape-scale adverse effects similar to those that occurred during the 1994 Rattlesnake (Figure 4) and 1989 Centella fires, and is not the intent of this plan.

Pre-PF treatment is expected to reduce the risk of live tree, snag and down log loss when PF burns through the PAC. The Forest Service anticipates retention of the majority of these components by low prescription PF, careful application techniques, timing (winter months), and keeping PF out of the 100-acre cores as much as possible. PF could be reasonably expected to impact any unknown MSO nests in unsurveyed habitat.

PF applied to the three designated burn blocks is expected to burn in a patchy mosaic pattern. Fire is expected to burn in different vegetation types and in different topographic areas with varying results. "Blowouts" are defined as fire that modifies the upper forest canopy (opens the canopy), and are expected to occur in chaparral or manzanita patches which are lightly scattered on the landscape. Some individual thickets of dense, small (less than nine inch diameter breast height or dbh) "dog-hair" thickets or saplings and trees are expected to burn hot and be killed, as are any small patches of existing chaparral or manzanita. Some down logs (between 23 and 31 centimeters [nine and 12 inches] diameter midpoint) are expected to be scorched and/or partially burned, and some areas may not burn at all. Trees greater than 12 inches dbh are not expected to be killed unless they occur in the midst of a dense, "dog-hair" thicket of smaller ladder fuels. Fireline construction will be handline scraped by handtools down to mineral soils, approximately 18 to 24 inches wide, and will be used primarily as pre-treatment measures for protection of MSO habitat components prior to PF being implemented in MSO habitat.

The majority of 1,000 hour fuels are anticipated to be retained during PF treatments due to low fire prescription and the timing of PF (winter months). A test burn conducted January 23 and 24, 1999, demonstrated that for that site, at that time of year, under the low PF fire prescription, very little of the 1,000 hour fuels (dead material seven centimeters or three inches or greater in diameter) were affected (see Appendix A for details). Based upon the Forest Service's experience and judgement, timing of the prescribed fire treatments and the low intensity prescriptions is anticipated to indirectly protect down logs equal to or greater than 31 (12 inches) in diameter. Because PF timing and prescription parameters are expected to produce a relatively cool fire regime, the Forest Service expects PF will safely reduce fuel loads with a minimum of negative impacts to the project area.

PF effects to MSO are expected to be carefully controlled and monitored. PF is expected to aid in reduction of high fuel loads and the risk of catastrophic wildfire in PACs, which often results in the loss of MSO habitat over large areas. PF is also expected to aid in creation of a diverse landscape with the horizontal vegetation diversity that seems to be relatively characteristic of many areas occupied by MSO. PF is anticipated to result in conditions that maintain shade-intolerant species such as ponderosa pine or Gambel oak in the landscape; species that occur in MSO preferred-habitats. While short-term PF effects can reduce MSO prey species in localized (treated) areas, these areas are only located in the lower elevational portions of three MSO PACs, and PF is not is expected to impact the 100-acre core sites around likely nest/roost sites, located farther up canyon in the PACs. Smoke management includes conditions where upper-level winds carry smoke out of the canyons occupied by MSO, and smoke is not expected to settle in these areas. Careful application and methodology of PF is anticipated to reduce ladder fuels and maintain the forested canopy cover, providing long-term benefits to MSO and its prey species.

Short-term decreases in small mammal prey species abundance are expected to occur in PF treatment areas the first year after a burn. Herbaceous species abundance and diversity has been shown to increase after an area has recovered from low prescription PF treatments. This often occurs within the two years following PF treatments and depends on soil moisture availability, erosion factors, seedbed availability, rainfall, and land management decisions. Small mammal population response to fire varies with the associated changes in their habitat. Deer mouse (*Peromyscus maniculatus*) populations may increase immediately following fire and then decrease through time (Ward and Block 1995). They concluded their findings were short-term impacts, with short-term positive numerical responses of mice attributed to increased forage, particularly grasses and forbs after fires.

WFRB Effects

WFRB fire effects to MSO can be variable. Mortality could result from a situation or circumstance in which fire kills, harms, injures or sickens a MSO, a pair, and/or the eggs/young associated with a pair of nesting MSO. WFRB could burn or torch an unknown nest/roost tree or site during the MSO breeding season. A heavy accumulation of smoke might settle for an extended period of time in a canyon, affecting MSO and eggs and/or young in an unknown or unsurveyed nest site.

WFRB can have different impacts to the vegetation understory that MSO prey species is dependent on, resulting in possible loss of MSO prey species. These losses are expected to be localized and short-term due to the Forest Service commitment to first-entry WFRB at the low prescription. Vegetation recovery is anticipated to begin the following growing season as new grasses and herbaceous plant species regenerate in the burned areas. A long-term result could be the return and future migration of different prey species (abundance and diversity) into the area.

Fire impacts and effects to MSO prey base can be complex and dependant on variations in fire behavior, prey abundance and diversity, and prey species habitat. Irvine (1991) documented

post-fire declines in deer mouse populations at study sites on the Coconino National Forest and attributed these declines to reduced food supplies which could have been a function of a more intense fire event. Lowe *et al.* (1978) noted an increase in deer mouse populations the first year after a fire in ponderosa pine forests near Flagstaff, Arizona, after a relatively "moderate" fire event. Small mammal population diversity and abundance within burned patches appears to be typically depressed for one to three years following fire (Wright and Bailey 1982).

Biswell *et al.* (1973) suggested rodent populations would be less affected during fall or winter fires because rodents had accumulated sufficient seed caches to mitigate their (relatively) short-term loss of above-ground herbaceous seeds. Predation of surviving rodents by MSO may increase immediately after fire, as a more opened foraging area may give MSO more opportunities to locate and secure their prey. Observations during a prescribed burn at Saguaro National Park noted MSO were foraging at night along the perimeter of the burn (Rick Anderson, pers. comm. 1998).

Seamans and Gutierrez (1999) found no relationship between MSO reproductive success and the proportion of white-footed mice (*Peromyscus* spp.) or woodrats (*Neotoma* spp.) consumed. As long as adequate overall prey was consumed, the species of prey (mice or woodrats) did not appear to affect reproductive success. Willey (1997) observed no behavioral differences in MSO during and after a prescribed burn at Saguaro National Park (Rincon Mountains, southern Arizona), and detected little change to forested landscapes. With more severe fire behavior (San Mateo Mountains, New Mexico), Stacey and Hodgson (1995) observed minimal effects, and although MSO were found to be foraging and roosting in burned areas afterwards, it was attributed to typical year-to-year variability in territory selection choices made by the owls.

Because first entry of WFRB in MSO habitats is expected to be at the low fire prescription, impacts in MSO habitat are anticipated to be those associated with low intensity ground fires. WFRB in MSO habitat can be expected to contribute to a loss of some down logs between 12 and 24 inches diameter midpoint; these logs are important MSO prey species habitat components. There could be slightly more expected loss of 1,000 fuels in the pine/oak habitat type than in the mixed conifer habitat type, due to the lower fuel moisture regime for the pine/oak (12 percent) compared to the mixed conifer (15 percent).

WFRB results in MSO habitat are anticipated to include some small-sized "blowouts", (where fire modifies or opens the canopy) of burned patches in the landscape and the creation of a few, smaller-diameter (less than 31 centimeters [12 inches] dbh) snags and down logs, as a small amount of tree mortality is known to occur after WFRB at the low prescription, depending on the landscape components. Dense clumps of "dog-hair" thickets that enclose snags or small-sized (less than nine inches dbh) trees can produce hotter fire in a very small space, opening a small patch of canopy. These results are expected to benefit MSO prey species within the first year following WFRB by adding a component of ground debris (fallen branches, needle-cast) and prey species habitat (fallen snags that become "new" down logs), aiding in MSO prey species habitat recovery.

Initial impacts to MSO foraging from first entry WFRB are expected to result in short-term (two years), localized (where fire occurs), reduced rodent distribution and abundance, especially the first year. Vegetation recovery is anticipated to be slow in the first year following a fire until rainfall and seed source replenishment results in increased vegetative habitat and MSO prey species distribution and abundance. In MSO habitat, down logs greater than 61 centimeters (24 inches) midpoint diameter) and live trees and snags greater than 12 inches dbh are expected to be retained through the low prescription for WFRB. As larger trees age and die over time, new snags and down material will accumulate. These habitat components will provide cover for MSO prey species and their structural diversity will allow for cooler temperatures and relative densities apparently preferred by MSO and prey species.

Winds blowing through the action area come from the southwest during the time of year when WFRB can be safely implemented. Due to the southwest and western aspects of the proposed action area, these winds are expected to lift any fire-created smoke up and out of the canyons towards the San Simon Valley. Smoke is not expected to settle due to these winds and to the requirements of meeting the Arizona Department of Environmental Quality (ADEQ) smoke permit. This is expected to reduce potential impacts due to smoke lingering in canyons where MSO (and other species) nest, roost, and forage. Willey (1997) notes limited evidence that well-dispersed smoke does not appear to significantly affect MSO behavior.

Fire monitoring personnel will be posted at designated vantage points to monitor smoke dispersal, vertical lifting and transport for all PF and WFRB operations, and one Wildlife Biologist or qualified Resource Advisor and one qualified Prescribed Fire Behavior Monitor or Prescribed Fire Specialist or Red-Carded Fire Observer will analyze smoke impacts associated with WFRB versus smoke impacts associated with fire suppression actions and inform the Burn Boss and/or Fire Boss or the Incident Commander as to their conclusions.

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.

There are no known present or future projects, authorized or under review, that are expected to contribute cumulative effects in the action area considered in this biological opinion for Yaqui chub or MSO.

CONCLUSION

After reviewing the current status of the Yaqui chub and the MSO, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of

the Yaqui chub or the MSO. No critical habitat for either species exists within or near the project area, thus none will be affected. The Service presents our conclusion of non-jeopardy for the following reasons:

1. The plan has established specific and detailed fire prescription parameters for both PF and WFRB to meet the described objectives. These parameters are expected to result in fire behavior that greatly minimizes fire impacts inside and outside the watershed contributing to the habitat of the Yaqui chub and MSO, resulting in a greater percent of unburned-to burned-mosaic, a greater amount of unburned needle cast distributed lightly on the forest floor, and a higher soil moisture level. Excessive soot, ash, sediment or smoke is not anticipated to occur at designated PF and WFRB levels, even if a typical rain event occurs soon afterwards;

2. The established buffer zone for West Turkey Creek of 61 meters (200 feet) will help ensure fire is neither ignited nor allowed to burn close to the creek, thus impacting Yaqui chub and its habitat;

3. The plan is expected to assist the Forest Service in restoring a more natural fire regime in the project area; intense, destructive fires will occur less frequently and severity of fire behaviors and impacts will decrease over time. This is especially likely to occur in the circumstances when WFRB is allowed to burn in an area already treated by PF. Negative impacts would be greatly reduced to species and habitats, due to the prior reduction in ladder and fine fuels, and the lessened intensity of WFRB in the presence of lighter fuel loadings.

4. This plan is designed to enable fires of varying size and intensity to create a mosaic pattern of burned and unburned vegetation on the landscape over time, as opposed to a future of large, extensive, conflagration-type wildfires that create greater, more severe and more continuous patterns of fire effects, to the detriment of the species and its habitat. The variability inherent in fire behavior and/or effects and impacts is influenced by, and influences, the nature of extremely variable landscapes and environments. Fire in simple vegetation structural arrangements will show less variation in fire effects compared to more complex mosaics of vegetation (Clark 1990, McPherson 1995);

5. While some livestock grazing will occur, it will be in a small portion of the general area of Mormon Ridge, and the vast majority of burned acreage in the project area will not be grazed by livestock. This will minimize livestock grazing effects to the watershed, and thus to the species;

6. The plan will create a mosaic pattern of smaller, patchy burned areas within the ignited perimeter, to be accomplished by reducing a minimum of one percent of the dead woody fuels less then three inches in diameter. The goal is to sustain a maximum of 70 percent unburned areas with a mosaic of burned areas within each treatment block of approximately 30 percent; and

7. Per the Forest Service's best management practices outlined in the watershed reports characterizing and developing recommendations for the project area, improvement and sustainability of watershed stability and conditions across higher-elevation communities is expected to occur, with improved herbaceous cover and decreased areas of bare ground resulting from increased watershed stability.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibits 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 by FWS 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 by FWS 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 Forest Service, so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The Forest Service has a continuing duty to regulate the activity covered by this incidental take statement. If the Forest Service (1) fails to assume and implement the terms and conditions or (2) fails to require the 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 Forest Service or applicant must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement. [50 CFR §402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

Yaqui chub

Incidental take of Yaqui chub will be difficult to detect for the following reasons: Yaqui chub are small-bodied; finding a dead or impaired specimen is unlikely; losses may be masked by seasonal fluctuations in numbers or climatic events, predation, or lack of reproductive success.

Take of this species will be based on the number of pools available to the Yaqui chub and the pool volumes in those available pools. Determining these parameters will require pre-and post-

fire event monitoring and analysis. Methods for measuring will be agreed upon between the Forest Service and the Service prior to WFRB (which is anticipated to begin June 2000, at the start of the annual monsoon season). Reference pools for monitoring will be identified by the District Wildlife Biologist. Baseline data on pool availability and pool volumes will be gathered no later than May 1, 2000.

Post-burn evaluations will be conducted after each burn event; if there is no appreciable sediment movement, measurements do not have to be taken at that time. Post-rain events should also be evaluated to the same standard. At a minimum, the Forest Service will measure available pools and their pool volume every five years.

Incidental take will occur when a 10 percent decrease is reached in the total number of pools and the total pool volumes available to Yaqui chub.

Incidental take is exceeded when any combination of pool availability and pool volume decreases beyond 10 percent.

Mexican spotted owl

Incidental take of MSO will be difficult to detect for the following reasons: MSO are wide-ranging; finding a dead or impaired specimen is unlikely; losses may be masked by seasonal fluctuations in numbers or climatic events, predation, or lack of reproductive success, potential nest and roost areas are unsurveyed or inadequately surveyed, and the steepness and remoteness of the species' habitat makes such findings very unlikely.

We anticipate incidental take of three known MSO PACs (six birds and associated eggs/young) due to project actions (North Fork Rucker #050103, Mormon Canyon #050108, and Pole Bridge #050110). In addition, we anticipate incidental take of two MSO PACs (four birds) due to project actions in 100-acre cores of unsurveyed MSO habitat.

For this project, the same birds may be "taken" in the forms of harm, harassment, and mortality, depending on the management activity, as a result of PF or WFRB. For this reason, the amount of take described below is greater than the total take anticipated above.

PF:

1. Harm to one known MSO PAC per year, due to fire occurring in the 100-acre core.

2. Harm to one unknown/undiscovered MSO PAC in unsurveyed/inadequately-surveyed MSO habitat, due to fire occurring in the 100-acre core.

Harm of a bird (and take) occurs when up to 600 acres have been burned in PF operations in any one year, for the life of this plan (10 years). Take is exceeded when more than 600 acres are burned in PF operations in any one year, for the life of this plan (10 years).

WFRB in PACs:

1. Harassment of three pair of MSO (and associated eggs/young), due to WFRB occurring in or adjacent to MSO PACs during the MSO breeding season (March 1 to August 31, annually).

2. Mortality and harm of three pair of MSO (and associated eggs/young), due to WFRB occurring in a 100-acre core, during any time of the year, for the life of this plan.

A PAC is affected when one+ acres of a PAC has burned under any level of fire intensity. Incidental take occurs when one PAC is affected. Incidental take is exceeded when more than one PAC is affected by WFRB per year, any one PAC is affected more than twice a year, and/or any time a "blowout", as defined in this opinion, occurs in a PAC.

After a PAC has been affected a second time, both agencies will review annual monitoring results to determine additional entries.

WFRB outside PACs in MSO habitat:

1. Mortality and harm to two pair MSO (two PACs) due to WFRB "blowouts" in unknown/undiscovered 100-acre core areas. A "blowout" is defined as a fire that modifies (opens) the upper forest canopy.

Mortality and harm occurs when WFRB blowouts of one to five acres in size, occur and reach a total of 20 acres, and/or when one blowout is greater than five acres in size, for the life of this plan. Take is exceeded when these parameters are exceeded.

2. Harm and harassment to two unknown/undiscovered PACs (2 pair MSO or 4 birds), due to WFRB in unsurveyed/inadequately-surveyed MSO habitat, and/or during the MSO breeding season .

Harm and harassment occurs when more than 600 acres have burned in any WFRB event in any one year.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to Yaqui chub or MSO.

REASONABLE AND PRUDENT MEASURES

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such

incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

Yaqui chub

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of Yaqui chub:

1. The Forest Service should conduct all PF and WFRB in a manner to minimize mortality of Yaqui chub;

2. The Forest Service should conduct all PF and WFRB to minimize destruction or modification of Yaqui chub habitat, including water quality and pool availability; and

3. The Forest Service should monitor and report PF and WFRB results to the Service annually during the annual plan review.

Terms and Conditions for Yaqui chub

In order to be exempt from the prohibitions of section 9 of the Act, the Forest 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, with the following **one** exception:

Implementation of this fire management plan will in no way constrain the Fire or Burn Boss/Incident Commander from taking any action as needed to protect life or property. In emergency (escaped fire or wildfire) situations, the Fire or Burn Boss/Incident Commander/Incident Management Team, in consultation with the Resource Advisor and the Prescribed Fire Behavior Monitor or Red-Carded Fire Observer, may decide NOT to implement specific terms and conditions if that implementation would place life or property in danger, or if delays caused by implementation would compromise efforts to protect listed species and/or their habitats.

In order to implement reasonable and prudent measure number 1:

a. The Forest Service shall not concentrate significant human activity (personnel and equipment, vehicle turnarounds, fire personnel, and other activities) in or adjacent to Yaqui chub habitat identified during the life of the plan (10 years). Such areas of human activities shall be kept to the minimum sized-area possible and shall be located in previously disturbed sites whenever possible.

b. The Forest Service shall not remove water from areas known to support Yaqui chub for use in PF and/or WFRB fire treatments, with the exception of an emergency situation. In an emergency situation, the Forest Service shall immediately notify the Service of any actions planned for that emergency action, including the possibility of using outside sources of water that may be incompatible (stock ponds, lakes, etc.) for water control on fire(s) in the West Turkey Creek watershed, and shall initiate an emergency consultation with the Service.

c. The Forest Service shall not allow moderate or significant prescription WFRB to occur in burn blocks 2, 3, and 4, until after either PF or low prescription WFRB has been implemented in the area. The Forest Service shall implement PF using the designated prescription and ignition patterns established in this biological opinion and the biological assessment, to create a mosaic of burned and unburned vegetation inside established ignited perimeters for each PF. The burn block size for PF will be small to begin with; ranging in size between 2.02 and 40.47 hectares (five and 100 acres) per year. Future areas scheduled for PF will not exceed 101.17 hectares (250 acres) in size in any given year within the perimeter of burn blocks 2, 3, and 4, as described in Figure 3.

d. The Forest Service shall, to the best of their ability, ensure the buffer zone protecting West Turkey Creek, as designated, is not subject to either direct ignition of PF or entry by WFRB.

In order to implement reasonable and prudent measure number 2:

a. The Forest Service shall provide current and seasonal environmental awareness and natural resource sensitivity training to all persons who are anticipated to participate in implementation and monitoring of this plan for the life of the plan (10 years). Personnel considered for this training shall include, but not be limited to, persons involved with PF, WFRB, and fire suppression activities, Burn Boss and/or Fire Boss, Incident Commander (IC), Wildlife Biologist(s), Resource Advisor(s), and all fire and fuel technicians, specialists, and staff.

b. Training shall include Forest Service best management practices, “light-on-the-land” methods, known information about listed species (Yaqui chub) habitat and population locations, 7.5 minute-topographic maps (1:24,000 scale), other appropriate maps, and information concerning the Endangered Species Act, as well as consequences of intentional violation of the Act, rules, regulations, guidelines and protective measures (as outlined in the “Project Description” section of this biological opinion).

c. At least one Prescribed Fire Behavior Monitor or Red-Carded Fire Observer shall be on site during all PF, WFRB, or escaped fire or wildfire activities. Their duty is to serve as information sources for the Burn Boss and/or Fire Boss, or the Incident Commander/Incident Management Team and the Resource Advisor.

d. The Forest Service shall assign at least one qualified Resource Advisor to any PF or WFRB fire. The Resource Advisor shall be a qualified Wildlife Biologist designated for managing concerns regarding natural resources, especially listed and sensitive species. The Resource Advisor shall serve as advisor to the Burn Boss and/or Fire Boss, or the Incident Commander/Incident Management Team. The Resource Advisor shall be on 24-hour, on-call status, when not actually on the fire, until formally relieved by another qualified Resource Advisor.

e. The Forest Service may utilize one person to conduct all duties of the Resource Advisor and Prescribed Fire Behavior Monitor or Red-Carded Fire Observer, if that person is currently qualified by the Forest Service to perform those duties.

f. The Forest Service shall develop and implement a rehabilitation plan for any areas identified as damaged by the Resource Advisor and/or Wildlife Biologist. The Forest Service shall rehabilitate any areas disturbed by burn preparation or fire operation activities, favoring the selection of native species over exotics. Any sites or areas identified as resource-damaged by the Wildlife Biologist or the Resource Advisor, or by persons acting under the guidance and review of these people, will be rehabilitated.

g. The Forest Service shall include enhancement and maintenance of Yaqui chub habitat as a fire management plan objective for all fire activities.

In order to implement reasonable and prudent measure number 3:

a. The Forest Service shall carefully evaluate PF, WFRB and any other fire actions for any impacts regarding Yaqui chub, West Turkey Creek watersheds, and fire treatment responses (erosion, water flow, turbidity, and quality, sedimentation loads, ash, smoke, silt, etc.) that could impact Yaqui chub or its habitat. The Forest Service shall monitor water quality and pool availability and characteristics (temperature, pH, sediments, etc.), in any stretch of Yaqui chub habitat pre- and post- PF operations. If any fire event is designated an escaped fire or wildfire situation, the Forest Service shall immediately notify the Service, and immediately monitor and document water quality, and pool depth, width, and characteristics, aimed at determining effectiveness of fire suppression activities in designated reference pool(s) as identified by the District Wildlife Biologist and/or the Resource Advisor.

b. The Forest Service shall conduct immediate post-fire observations for PF and WFRB that includes a ground review of on-going burning by a qualified Prescribed Fire Behavior Monitor or a Red-Carded Fire Observer, a qualified Resource Advisor and the Burn Boss and/or Fire Boss. The qualitative walk-through shall be conducted and photos shall be taken and labeled at pre-established photo points. Specific fire-related variables (i.e. weather, fuels, fire behavior, smoke, and post-fire consumption patterns) shall be documented and a report sent within 60 days of completion of the activity to the Service.

c. The Forest Service shall not be restrained from participation in any mutual aid agreements with local governments and any understandings or agreements with the Service to provide technical assistance and information during activities associated with this plan, for the life of this plan (10 years).

Mexican spotted owl

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize impacts of incidental take to MSO:

1. The Forest Service shall conduct all PF to minimize harm and harassment of MSO and associated core areas;

2. The Forest Service shall conduct all fire to minimize impacts to MSO and habitat; and

3. The Forest Service will monitor fire and results, and review all information with the Service annually, and continue to inform the Service of all decisions associated with this plan.

Terms and Conditions for Mexican spotted owl

In order to be exempt from the prohibitions of section 9 of the Act, the Forest 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, with the following **one** exception:

Implementation of this fire management plan will in no way constrain the Fire or Burn Boss/Incident Commander from taking any action as needed to protect life or property. In emergency (escaped fire or wildfire) situations, the Fire or Burn Boss/Incident Commander/Incident Management Team, in consultation with the Resource Advisor and the Prescribed Fire Behavior Monitor or Red-Carded Fire Observer, may decide NOT to implement specific terms and conditions if that implementation would place life or property in danger, or if delays caused by implementation would compromise efforts to protect listed species and/or their habitats.

In order to implement reasonable and prudent measures number 1:

a. The Forest Service shall not concentrate significant human activity (personnel and equipment, vehicle turnarounds, fire personnel, and other activities) in or adjacent to MSO PACs or 100-acre core areas identified during the life of the plan (10 years). Such areas of human activities shall be kept to the minimum sized-area possible and shall be located in previously disturbed sites whenever possible.

b. The Forest Service shall include 100-acre cores (in PACs) as a fire protection objective.

c. After a PF event in a PAC, the Forest Service shall monitor that PAC for one MSO breeding season immediately following the PF event. Every effort will be made to locate MSO in the PAC, and the Forest Service shall modify, as needed, the designated 100-acre core.

d. If a 100-acre core is entered by PF, the Forest Service shall monitor that PAC for two consecutive MSO breeding seasons immediately following the PF event.

e. The Forest Service shall not directly ignite down logs greater than 12 inches midpoint diameter, shall not ignite PF downslope from any MSO 100-acre core area, and shall ensure, to the best of their ability, to keep headfires from occurring downslope from any MSO 100-acre core area.

In order to implement reasonable and prudent measure number 2:

a. The Forest Service shall provide seasonal and current environmental awareness and natural resource sensitivity training to all persons who are anticipated to participate in implementation and monitoring of this plan for the life of the plan (10 years). Personnel considered for this training shall include, but not be limited to, persons involved with PF, WFRB, and fire suppression activities, Burn Boss and/or Fire Boss, Incident Commander (IC), Wildlife Biologist(s), Resource Advisor(s), and all fire and fuel technicians, specialists, and staff.

b. Training shall include Forest Service best management practices, "light-on-the-land" methods, known information about listed species (Mexican spotted owl) habitat, MSO PACs, any nest and/or roost site locations, 7.5 minute-topographic maps (1:24,000 scale), other appropriate maps, and information concerning the Endangered Species Act, as well as consequences of intentional violation of the Act, rules, regulations, guidelines and protective measures (as outlined in the "Project Description" section of this biological opinion).

c. One Prescribed Fire Behavior Monitor or Red-Carded Fire Observer shall be on site during all PF, WFRB, or escaped fire or wildfire activities. Their duty is to serve as information sources for the Burn Boss and/or Fire Boss, or the Incident Commander/Incident Management Team and the Resource Advisor.

d. The Forest Service shall assign at least one qualified Resource Advisor to any PF or WFRB fire. The Resource Advisor shall be a qualified Wildlife Biologist designated for managing concerns regarding natural resources, especially listed and sensitive species. The Resource Advisor shall serve as advisor to the Burn Boss and/or Fire Boss, or the Incident Commander/Incident Management Team. The Resource Advisor shall be on 24-hour, on-call status, when not actually on the fire, until formally relieved by another qualified Resource Advisor.

e. The Forest Service may utilize one person to conduct all duties of the Resource Advisor and Prescribed Fire Behavior Monitor or Red-Carded Fire Observer, if that person is currently qualified by the Forest Service to perform those duties.

f. The Forest Service shall not be restrained from participation in any mutual aid agreements with local governments and any understandings or agreements with the Service to provide technical assistance and information during activities associated with this plan, for the life of this plan (10 years).

g. The Forest Service shall develop and implement a rehabilitation plan for any areas identified as damaged by the Resource Advisor and/or Wildlife Biologist. The Forest Service shall rehabilitate any areas damaged by burn preparation or fire operation activities, favoring the selection of native species over exotics. Any sites or areas identified as resource-damaged by the Wildlife Biologist or the Resource Advisor, or by persons acting under the guidance and review of these people, will be rehabilitated.

In order to implement reasonable and prudent measure number 3:

a. The Forest Service shall conduct pre- and post-fire habitat monitoring in MSO PACs for PF, according to the Forest Service-approved MSO microhabitat monitoring protocol, annually, for the life of this plan. The Forest Service shall provide monitoring data and analysis, and updates to the Service by March 1, annually, beginning March 1, 2000. The reports shall include 1:24,000 scale maps of MSO restricted habitat acres monitored, and other monitored acres, shown by habitat type.

b. After PF has been conducted in burn blocks 2, 3, and 4, the Forest Service proposes to conduct maintenance burns every four to seven years to maintain desired (reduced) fuel loads. A future schedule of these maintenance burns, with 1:24,000 scale maps, shall be provided to the Service as soon as is known by the Forest Service.

c. The Forest Service shall report the results of their WFRB monitoring analysis in a report sent to the Service within 60 days of completion of the activity. The report shall include a 1:24,000 scale map of the burn perimeter, the total number of MSO restricted habitat acres burned, and of those total acres, the location, size and number of "blowout" acres that occurred.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Forest Service must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

DISPOSITION OF DEAD OR INJURED LISTED SPECIES

Upon locating a dead or injured threatened or endangered listed species, initial notification must be made to the Service's Division of Law Enforcement, 26 North McDonald, Suite 105, Mesa, Arizona, 85201, phone number 602/835-1957, within three working days of its finding. The Service can advise as to handling of dead or injured listed species. Written notification must be made within five calendar days and include the time, date, and location of the specimen, a photograph, and any other pertinent information. Care must be taken in handling injured animal species to ensure effective treatment and care, and in handling dead specimens to preserve biological material in the best possible condition. Injured animal species should be transported to a qualified veterinarian by a qualified biologist. Should any treated listed animal species survive, the Service should be contacted regarding the final disposition of the animal.

If feasible, the Service will ensure that the remains of intact specimens of listed animal species to be submitted to educational or research institutions holding appropriate State and Federal permits. If such institutions are not available, the information noted above shall be obtained and the carcass left in place. Arrangements regarding proper disposition of potential museum specimens shall be made with the institution prior to implementation of the action.

CONCURRENCES

American peregrine falcon (*Falco peregrinus anatum*)

The American peregrine falcon (*Falco peregrinus anatum*) was removed from the Federal list of Endangered and Threatened Wildlife on August 25, 1999 (USFWS 1999a). Federal agencies are no longer required to consult with the Service under section 7 of the Endangered Species Act (Act) in the event activities they authorize, fund or carry out affect peregrine falcons. However, removal of the protection of the Act will not affect the protection afforded all peregrine falcons under the Migratory Bird Treaty Act. In addition, the Act requires monitoring of the species for at least five years after delisting. This monitoring will consist, at a minimum, of annual occupancy surveys for assessing productivity, determining contaminant concentrations, and monitoring levels of take of peregrine falcons for falconry purposes (63 FR: 45446). The Service is currently developing a monitoring plan which will be available in the near future (USFWS 1999a).

Lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*)

The lesser long-nosed bat is a medium size, leaf-nosed bat with a long muzzle, a long tongue, and is hover-flight capabilities. These features are adaptations to feed on nectar from the flowers of columnar cacti such as the saguaro (*Cereus giganteus*) and organ pipe cactus (*Stenocereus thurberi*), and from paniculate agaves such as Palmer's agave (*Agave palmeri*) and Parry's agave (*A. parryi*) (Hoffmeister 1986). Nectar from these cacti and agave are high energy food.

The lesser long-nosed bat is migratory and found throughout its historic range, from southern Arizona and extreme southwestern New Mexico, through western Mexico, and south to Guatemala (USFWS 1997b). In southern Arizona, lesser long-nosed bat roosts have been found in the Picacho Mountains (Pinal County) southwest to the Agua Dulce Mountains (Pima County), southeast to the Chiricahua Mountains (Cochise County) and south to the international boundary between the United States and Mexico. Individual bats have been observed near the Pinaleno Mountains (Graham County) and as far north as the McDowell Mountains (Maricopa County) (AGFD 1988, 1999).

Arizona lesser long-nosed bat roosts are occupied from late April to October (Cockrum and Petryszyn 1991). These roosts are typically at low elevations near concentrations of flowering columnar cacti. Litter size is one. After the young are weaned these colonies disband in July and August; some females and young move to higher elevations, ranging higher than 1,818 meters (6,000 feet), primarily in the southeastern parts of Arizona near concentrations of blooming paniculate agaves. Male bats roost primarily in bachelor groups and are known mostly from the Chiricahua Mountains, but some male bats occur with adult females and young of the year at maternity sites (USFWS 1997b).

Suitable day roosts and suitable concentrations of food plants are the two resources that are crucial for the lesser long-nosed bat (USFWS 1997b). Caves and mines are used as day roosts by the species. The factors that make roost sites useable have not yet been identified. Whatever the factors are that determine selection of roost locations, the species appears to be sensitive to human disturbance. Instances are known where a single brief visit to an occupied roost is sufficient to cause a high proportion of lesser long-nosed bats to temporarily abandon their day roost and move to another. It may be that most disturbed bats will return to their preferred roost in a few days; however, this sensitivity suggests that the presence of alternate suitable roost sites may be critical when disturbance occurs. Interspecific interactions with other bat species may also influence lesser long-nosed bat roost requirements.

A suitable day roost is probably the most important habitat requirement, but potentially suitable roosts must be within reasonable foraging distances of sufficient amounts of required foods before they will be used by this species. It appears the lesser long-nosed bat forages over wide areas and that large roosts require extensive stands of cacti or agaves for food. Destruction of food plants many kilometers from a roost could have a negative impact on this bat (USFWS 1997b). Adequate numbers of flowers or fruit are required within foraging range of day roosts and along migration routes to support large numbers of this species. Locations of suitable, "good" feeding sites play an important role in determining availability of potential roosting sites, and roost/food requirements must be considered jointly when discussing the habitat requirements of this species.

Concentrations of food resources appear to be patchily distributed across the landscape of Arizona and New Mexico, and the nectar and fruit required by this species is only seasonally available. Cacti flowers and fruit are available during the spring and early summer; blooming

agaves are available through the summer, primarily from July through early October, though Parry's agave blooms earlier. Columnar cacti occur in lower elevation areas of the Sonoran Desert region, and paniculate agaves are found primarily in higher elevation desert scrub areas, desert grasslands and shrublands, and into the mountains. Parry's agave is usually found at higher elevations than Palmer's agave (Gentry 1982). The bats are generally considered to time their movement and feeding to the progression of flowering associated with these cacti and agaves. Many species of columnar cacti and agaves appear to provide a "nectar corridor" for lesser long-nosed bats as they migrate in spring from Central America and Mexico to as far north as southern Arizona, through fall when they return south (Gentry 1982, Fleming *et al.* 1993, Slauson *et al.* 1998). Parry's agave may be of greater importance as a forage plant for those bats which arrive in southeastern Arizona during late spring and early summer.

Activities that adversely affect the density and productivity of columnar cacti and paniculate agaves may adversely affect populations of lesser long-nosed bats (Abouhalder 1992, USFWS 1997b). Agave mortality due to fire may affect the abundance and distribution of blooming agaves on the landscape for many years into the future, especially if there is high mortality within certain age/size class. Although the availability of blooming agaves may be affected by fire, the nectar production and sugar content of surviving plants is little effected. Working in the Peloncillo Mountains, Slauson *et al.* (1998) found that nectar production and sugar content did not differ between unburned agaves and burned agaves that did not have greater than 80 to 90 percent of the leaf area burned. The complexity of variables influencing agave flowering may mask the effects of a fire on agave flowering.

Foraging factors important to *Leptonycteris* bats concern the availability of agave flowering stalks, each and every year. In southeastern Arizona, Palmer's and Parry's agaves are the only reliable food resource for long-nosed bats in mid to late summer. Nectar-feeding bats are opportunistic foragers, taking advantage of local floral resources. During the breeding season lesser long-nosed bats may fly great distances in search of food resources, and later in the season they may shift roost sites and foraging areas based on the presence (or absence) of flowering agaves (Yar Petryszyn, pers. comm., 1997). The distance the bats will forage from a roost site appears to be related to the size of the colony and the available floral resources (Virginia Dalton, pers. comm. 1997, Y. Petryszyn, pers. comm. 1997). Lesser long-nosed bats are generally present in southeastern Arizona after the bats have left their maternity colonies and migrated to southeast Arizona and southwest New Mexico in middle to late summer when agaves are in flower.

Minimal and scattered areas within the project area support densities of agaves (Figure 2). No agave patches exist within the higher elevation forest where the PF treatment is proposed, and WFRB is proposed to be managed at the previously-described low and moderate fire prescriptions. Agave mortality under these "cool" fire prescriptions is expected to be lower than mortality occurring under a more typical, "hot" pre-monsoon fire event. Monitoring has shown that agave mortality under these typical events result in mortalities of 20 percent or less (Slauson

et al. 1999). Disturbances to known bat roosts and colonies are not expected to occur from any actions or activities of this proposed project.

Jaguar (*Panthera onca*)

Brown (1983) presented an analysis suggesting a resident breeding population of jaguars existed in the southwestern United States at least into the 20th century. Goldman (1932) believed the jaguar was a regular, but not abundant, resident in southeastern Arizona. Hoffmeister (1986) considered the jaguar an uncommon resident species in Arizona. He concluded the reports of jaguars between 1885 and 1965 indicated a small but resident population once occurred in southeastern Arizona. Brown (1983) suggested the jaguar in Arizona ranged widely throughout a variety of habitats from Sonoran desert scrub upward through subalpine conifer forest. Most of the records were from Madrean evergreen-woodland, shrub-invaded semidesert grassland, and along rivers.

The most recent records of jaguar in the United States are from the New Mexico/Arizona border area and in southcentral Arizona, both in 1996, and confirmed through photographs. In 1971, a jaguar was taken east of Nogales, Arizona, and in 1986, one was taken from the Dos Cabezas Mountains in Arizona. The latter individual reportedly had been in the area for about a year before it was killed (Ron Nowak, pers. comm. 1992).

The Arizona Game and Fish Department (1988) cited two recent reports of jaguars in Arizona. The individuals were considered to be transients from Mexico. One of the reports was from 1987 from an undisclosed location. The other report was from 1988, when tracks were observed for several days prior to the treeing of a jaguar by hounds in the Altar Valley, Pima County. An unconfirmed report of a jaguar at the Coronado National Memorial was made in 1991 (Ed Lopez, pers. comm. 1992). In 1993, an unconfirmed sighting of a jaguar was reported for Buenos Aires National Wildlife Refuge (William Kuvlesky, pers. comm. 1997).

Brown (1991) did not believe the jaguar was extirpated from northern Mexico. Although jaguars were considered relatively common in Sonora in the 1930's and 1940's, he cited a population about 800 miles south of the United States-Mexico border as the most northern officially reported. Brown suggested there may be more jaguars in Sonora than are officially reported. He mentioned reports of two jaguars which were killed in central Sonora around 1970. He also discussed assertions by the local Indians that both male and female jaguars still occurred in the Sierra Bacatete about 200 miles south of Arizona. Brown speculated if a reproducing population of jaguars is still present in these mountains, it may be the source of individuals which travel northward through the Sierra Libre and Sierra Madera until they reach Arizona.

Nowak (1992) mentioned that as late as 1987, the species was still considered common in the Sierra Bacatete near Guaymas, Sonora. Brown (1989) reported biologists from Mexico have stated at least two jaguars have been killed in Chihuahua. In Arizona, jaguar prey populations

have increased, and large tracts of brush and canyon woodland are still available to provide cover for jaguars.

Potential habitat exists within the Chiricahua Mountains for the jaguar. While there are no obvious riparian corridors linking this range to Sonora Mexico, riparian and woodland cover is moderate to dense in much of the mountains. The remoteness of the range may promote accessibility by the jaguar as well as hinder its detection.

The jaguar's prey base (white-tail and mule deer) is stable and diverse in the project area as well as in the entire mountain range. Fire and burn operations will not substantially alter the existing habitat structure and composition, and those areas treated by fire will be relatively small compared to the entire available foraging range available to the jaguar.

Mexican gray wolf (*Canis lupus baileyi*)

The Mexican gray wolf historically inhabited eastern and central Arizona, the Mogollon Plateau, southern New Mexico, western and central Texas and the Sierra Madre Occidential are of western Mexico (Bednarz 1988). It is normally found in the upper Sonoran zone but can range from 914.4 to 3,657.6 meters (3,000 to 12,000 feet) in elevation. Vegetation types vary from chaparral desertscrub to spruce-fir forests. Habitat types are primarily Madrean evergreen forests and woodlands and include pine, oak woodlands, pinyon-juniper forests, riparian areas and grasslands above 4,500 feet elevation (Brown 1983).

The Mexican gray wolf is generally believed to be extirpated from Arizona (McBride 1986, Hoffmeister 1986), although occasional individual sightings are reported in southern Arizona. The Service is currently reintroducing this species into the Blue River Primitive Area of west-central Arizona. There have been a number of unconfirmed wolf sightings on the Coronado National Forest; a relatively reliable sighting was of three animals seen in Canelo Hills, Santa Cruz County, in 1992 (AGFD 1999). Two unconfirmed sightings were reported in the Guadalupe Canyon (Peloncillo Mountains) area in the early 1990's. Wolf field surveys that were conducted in the Chiricahua Mountains from January to February of 1994 did not detect any wolf sign.

The Coronado National Forest supports approximately 566,562.22 hectares (1,400,000 acres) of potential Mexican wolf habitat. Of that total, the Chiricahua Mountains supports approximately 20 percent and the project area supports approximately two percent.

A stable and diverse prey base (white-tail and mule deer, javelina, jackrabbit and cottontail) occurs in the entire mountain range and is potentially available to any wolves that might travel or inhabit the range. PF and WFRB will alter relatively small areas of prey species habitat, and may provide more foraging opportunities (increased grasses, forbs, and herbaceous species) after treatments.

Due to the minimization measures the Forest Service has detailed in this proposed project on behalf of these listed species, and the reasons detailed above, the Service concurs with the Forest Service that the proposed action is not likely to adversely affect the lesser long-nosed bat, the jaguar, and the Mexican gray wolf.

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.

Yaqui chub

1. We recommend that the Forest Service evaluate and establish several appropriate sites for reintroduction of Yaqui chub into the Chiricahua Mountains.

2. We recommend that the Forest Service evaluate and reduce recreation-based impacts in the West Turkey Creek watershed.

3. We recommend that the Forest Service assist with implementation of the Habitat Conservation Plan for the El Coronado Ranch.

Mexican spotted owl

1. We recommend that the Forest Service survey, locate and map all MSO restricted habitat (per the 1995 MSO Recovery Plan definition) that occurs in the Chiricahua Mountains, beginning with the Johnson Peak planning area, using Forest Service approved protocols and per MSO Recovery Plan guidance, prior to future PF implementation.

2. In any year that any fire event occurs in any MSO PAC on the district, we recommend that the Forest Service monitor that PAC through the following MSO breeding season and report the results to the Service.

3. We recommend that the Forest Service survey all unsurveyed and/or inadequately-surveyed MSO restricted habitat where PF is planned to occur for the next three years (2001, 2002, and 2003).

4. We recommend that the Forest Service conduct, participate or help fund a study of MSO prey species regarding PF and WFRB and their effects to these prey species and their habitats.

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

REINITIATION NOTICE

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

The Service appreciates your efforts on behalf of listed species and the public lands they inhabit. The ecosystem-based approach to fire management, with incorporation of considerations for listed species and their habitat, is appreciated. Please contact Thetis Gamberg (602/640-2720, x230) or Sherry Barrett (520-740-2764) of my staff with further questions or concerns. Please refer to consultation number 2-21-98-F-286 in future correspondence.

Sincerely,

/s/ David L. Harlow
Field Supervisor

Appendices (3)

cc: Regional Director, Fish and Wildlife Service, Albuquerque, NM (PARD-ES; Steve Chambers)
Field Supervisor, Fish and Wildlife Service, Albuquerque, NM

Terry Johnson, Nongame Branch, Arizona Game and Fish Department, Phoenix, AZ

JOHNSON PEAK BO/J P BO.wpd:tatg

REFERENCES CITED

AGFD. 1988. Threatened native wildlife in Arizona. Arizona Game and Fish Department publication. Phoenix, Arizona. 32pp

AGFD. 1999. Heritage management data system. Arizona Game and Fish Department, Nongame Branch, Phoenix, Arizona.

Abbott, L.B. 1997. The ecological role of fire in semidesert grassland ecosystems of southeastern Arizona. Unpublished report, # USPE 050197. The Nature Conservancy, Arizona Chapter, Tucson, Arizona.

-----. 1998. The ecological role of fire in southeastern Arizona oak woodland ecosystems. Unpublished report, # USPE 041498. The Nature Conservancy, Arizona Chapter, Tucson, Arizona.

Abolt, R.A.P. 1997. Fire histories via fire-scar and stand age structure analysis. Master's Thesis publication. School of Renewable Natural Resources, University of Arizona, Tucson, Arizona.

Abouhalder, F. 1992. Influence of livestock grazing on saguaro seedling establishment. Pages 57-61 *in* Stone, C.P., and E.S. Bellantoni, eds., Proc. Symp. Research in Saguaro National Monument, Tucson.

Anderson, Rick. 1998c. Saguaro National Park, Tucson, Arizona. Personal communication.

Archer, S. 1994a. Woody plant encroachment into southwestern grasslands and savannas: rates, patterns and proximate causes. Pages 13-68 *in* M. Vavra, W. A. Laycock and R. D. Pieper. Ecological Implication of Livestock Herbivory in the West. Society of Range Management, Denver, Colorado.

-----. 1994b. Regulation of ecosystem structure and function: climatic versus non-climatic factors. Pages 245-255 *in* J.E. Griffiths. Handbook of Agricultural Meteorology. Oxford University Press, Oxford, England.

Bahre, C.J. 1977. Land-use history of the research ranch, Elgin, Arizona. J. Arizona Academy of Science 12:1-32.

-----. 1991. A legacy of change: historic impact on vegetation in the Arizona borderlands. University of Arizona Press, Tucson, Arizona.

-----. 1995. Human impacts on the grasslands of southeastern Arizona. Pages 230-264 *in* M.P. McClaran and T.R. Van Devender. The Desert Grassland. University of Arizona Press, Tucson, Arizona.

Bailey, V. 1905. Biological survey of Texas. North American Fauna, No. 25. 222pp.

Barrows, J.S. 1978. Lightning fires in southwestern forests. Final report to USDA, USFS. Coop. Agree. # 16-568-CA. Rocky Mtn. For. & Rang. Exp. Stn., Fort Collins, Colorado. Colorado State University, Fort Collins, Colorado.

Bednarz, W. H. 1988. The Mexican wolf: biology, history and prospects for reestablishment in New Mexico. USFWS Endangered Species Report 18. 70pp.

Biswell, H.H., H.R. Kallander, R. Komarek, R.J. Vogl, and H. Weaver. 1973. Ponderosa fire management. Tall Timbers Research Station, Misc. Publ. 2. Tall Timbers Research Station, Florida.

Brown, D.E. 1983. On the status of the jaguar in the Southwest. Southwestern Naturalist 28:459-460.

Brown, D.E. 1989. Cat fever. Game Country (May/June):63-72.

Brown, D.E. 1991. Revival for El Tigre? Defenders 66(1):27-35.

Brown, D.E. 1994. Biotic communities of southwestern United States and northwestern Mexico. University of Utah Press, Salt Lake City, Utah.

Clark, J.S. 1990. Landscape interactions among nitrogen, species composition, and long-term fire frequency. Biogeochemistry 2:1-22.

Cockrum, E.L., and Y. Petryszyn. 1991. The lesser long-nosed bat *Leptonycteris*: An endangered species in the Southwest? Texas Tech Univ., Occas. Pap. Mus., Number 142.

Dalton, V.M. 1997. Personal communication. Tucson, Arizona.

Danzer, S.R., C.H. Baisan, and T.W. Swetnam. 1996. The influence of fire and land-use history on stand dynamics in the Huachuca Mountains of southeastern Arizona. Pages 265-270 *in* The Effects of Fire on Madrean Province Ecosystems. USDA USFS Gen. Tech. Rept. RM GTR-289. Rocky Mtn. Rang. & Exp. Stn., Fort Collins, Colorado.

DeMarais, B. D. 1991. *Gila eremica*, a new cyprinid fish from northwestern Sonora, Mexico. Copeia 1991(1):178-189.

Duncan, R. B., and J. Taiz. 1992. A preliminary understanding of Mexican spotted owl habitat and distribution in the Chiricahua Mountains and associated sub-Mogollon mountain ranges in southeastern Arizona. Pages 58-61 *in* A.M. Barton and S.A. Sloane, eds. Proc. Chiricahua Mtns. Res. Symp. Southwest Parks and Monuments Association, Tucson, Arizona.

Fleming, T.H., R.A. Nunez, and L.S.L. Sternberg. 1993. Seasonal changes in the diets of migrant and non-migrant nectarivorous bats as revealed by carbon stable isotope analysis.

Fletcher, K., and H. Hollis. 1994. Habitat used, abundance, and distribution of the Mexican spotted owl, *Strix occidentalis lucida*, on National Forest System lands. USDA USFS. Southwestern Region, Albuquerque, New Mexico. 86pp.

Ganey, J.L. 1988. Distribution and habitat ecology of Mexican spotted owls in Arizona. Master's Thesis publication. Northern Arizona University, Flagstaff, Arizona.

-----, and R.P. Balda. 1989. Distribution of habitat use of Mexican spotted owls in Arizona. Condor 91:355-361.

-----, W.M. Block, J.K. Dwyer, and B.E. Strohmeyer. 1998a. Demography of two Mexican spotted owl (*Strix occidentalis lucida*) populations in Arizona and New Mexico: 1997 Final report. Unpub. Rept. Contract # 53-82FT-4-07. Humboldt State University, Arcata, California. 16pp.

-----, -----, -----, -----, and J.S. Jenness. 1998b. Dispersal, movements and survival rates of juvenile Mexican spotted owls in Northern Arizona. Wilson Bull. 110(2):206-217.

Gelbach, F. R. 1981. Mountain islands and desert seas. Texas A&M University Press, College Station, Texas.

Gentry, H.S. 1982. Agaves of Continental North America. Univ. of Arizona Press, Tucson, Arizona.

Goldman, E.A. 1932. The jaguars of North America. Proc. Biol. Soc. Washington 45:143-146.

Grissino-Mayer, H.D., C.H. Baisan, and T.W. Swetnam. 1994. Fire history in the Pinaleno Mountains of southeastern Arizona: effects of human-related disturbance. Pages 399-407 in Biodiversity and Management of the Madrean Archipelago: The Sky Islands of Southwestern United States and Northwestern Mexico. USDA USFS Gen. Tech. Rept. RM-GTR 264. Rocky Mtn. Rang. & Exp. Stn., Fort Collins, Colorado.

Hastings, J.R., and R.M. Turner. 1965. The changing mile: An ecological study of the vegetation change in the lower mile of an arid and semiarid region. University of Arizona Press, Tucson. 317pp.

Hayworth, K. and G. R. McPherson. 1994. Effects of *Quercus emoryi* on herbaceous vegetation in a semi-arid savanna. Vegetation 112: 153-159.

Hendrickson, D. A., W. L. Minckley, R. R. Miller, D. J. Siebert, and P. H. Minckley. 1980. Fishes of the Rio Yaqui basin, Mexico and United States. J. Ariz.-Nev. Acad. Sci. 15(3):1-106.

Hoffmeister, D.F. 1986. Mammals of Arizona. University of Arizona Press, Tucson, Arizona.

Humphrey, R.R. 1958. The desert grassland; a history of vegetational change and an analysis of causes. Botanical Review 24:193-252.

Irvine, L.R. 1991. Disturbance and small mammals: effects of prescribed fire on white-footed mice (*Peromyscus*). Master's Thesis. Northern Arizona University, Flagstaff, Arizona.

Jandrey, F. 1975. Chiricahua National Monument fire history. Unpub. manu. USDI, NPS, Chiricahua National Monument, Arizona.

Kaib, J. M. 1998. Fire history in riparian canyon pine-oak forests and the intervening desert grasslands of the southwest borderlands: a dendroecological, historical, and cultural inquiry. Master's Thesis. School of Renewable Natural Resources, University of Arizona, Tucson, Arizona.

Kruse, W.H., G.J. Gottfried, D.A. Bennett and H. Mata-Manqueros. 1996. The role of fire in Madrean encinal oak and pinyon-juniper woodland development. Pages 99-106 *in* P.F. Ffolliott, A. Ortega-Rubio, G.J. Gottfried, R.H. Hamre and C.B. Edminster, eds. Biodiversity and Management of the Madrean Archipelago: the Sky Islands of the Southwestern United States and Northwestern Mexico. USDA USFS Gen. Tech. Rept. RM GTR-289. Rocky Mtn. Rang. & Exp. Stn., Fort Collins, Colorado.

Kuvlesky, W. 1997. Personal communication. USFWS, Buenos Aires NWR, Sasabe, Arizona.

Lopez, E. 1992. Personal communication. Tucson, Arizona.

Lowe, P.O., P.F. Ffolliott, J.H. Dieterich, and D.R. Patton. 1978. Determining potential wildlife benefits from wildfire in Arizona ponderosa pine forests. USDA USFS Gen. Tech. Rept. RM GTR-52. Rocky Mtn. Rang. & Exp. Stn., Fort Collins, Colorado.

Martin, S.C. 1975. Ecology and management of southwestern semidesert grasses and shrub ranges: the status of our knowledge. USDA USFS. Gen. Tech. Rept. RM GTR-156. Rocky Mtn. Rang. & Exp. Stn., Fort Collins, Colorado.

McBride, R.C. 1980. The Mexican wolf: a historical review and observations on its status and distribution. USFWS. Regional Office, Albuquerque, New Mexico. 38pp.

McPherson, G.R. 1995. The role of fire in the desert grasslands. Pages 130-151 *in* McClaran and T.R. Van Devender, eds. The Desert Grassland, University of Arizona Press, Tucson, Arizona.

-----. 1997. Ecology and management of North American savannas. Pages 84-105. University of Arizona Press, Tucson, Arizona.

-----, and J. F. Weltzin. 1998. Herbaceous response to canopy removal in southwestern oak woodlands. J. of Rang. Mngt. 51: 674-678.

Minckley, W. L. 1973. Fishes of Arizona. Arizona Game and Fish Department, Phoenix, Arizona.

-----, and J. E. Brooks. 1985. Transplantations of native Arizona fishes: records through 1980. J. Ariz.-Nev. Acad. Sci. 20(2):73-89.

Minshall, G.W., J.T. Brock, and J.D. Varley. 1989. Wildfires and Yellowstone's stream ecosystems. BioScience 39: 707-715.

-----. 1992. Personal communication. Tucson, Arizona.

Pase, C.P., D.E. Brown, and C.E. Granfeldt. 1977. tech. coords., The use of fire on Arizona rangelands. Arizona Interagency Range Commission., Publication # 4.

Petryzsyn, Yar. 1997. Personal communication. Vertebrate Museum, University of Arizona, Tucson, Arizona.

Pollisco, R.R., P.F. Ffolliott and G.J. Gottfried. 1995. Ecological conditions in the overlap areas of the pinyon-juniper and encinal woodlands. Pages 594-596 *in* L.F. Debano, P.F. Ffolliott, A. Ortega-Rubio, G.J. Gottfried, R.H. Hamre and C.B. Edminster. Biodiversity and Management of the Madrean Archipelago: the Sky Islands of the Southwestern United States and Northwestern Mexico. USDA USFS. Gen. Tech. Rept. RM GTR-218. Rocky Mtn. For. & Rang. Exp. Stn., Fort Collins, Colorado.

Rinne, J.N. 1999. Fish and grazing relationships: the facts and some pleas. Fisheries 24(8):12-21.

-----, and A.L. Medina. 1992. Fire, fish, floods: The Dude fire, Arizona, 1990. Proceedings from Desert Fishes Council Annual Symposium 26: 30.

Robinett, Dan. 1996. National Resources Conservation Services. Person communication. Tucson, Arizona.

Seamans, M.E., and R.J. Gutierrez. 1999. Diet composition and reproductive success of Mexican spotted owls. J. Raptor Res. 33 (2): 143-148.

Slauson, L., V. Dalton, and D. Dalton. 1998. Effects of prescribed burning on the Palmer agave and lesser long-nosed bat. Research Joint Venture Agreement No. 28-JV7-943.

-----, V. Dalton, and D. Dalton. 1999. Effects of prescribed burning on Palmer agave and the lesser long-nosed bat. Pages 111-114 *in* Gottfried *et al.*, coords., Toward Integrated Research, Land Management, and Ecosystem Protection in the Malapai Borderlands: Conference Summary. USDA, Forest Service, RMRS-P-10, Rocky Mtn. For. & Rang. Exp. Stn., Ft. Collins, Colorado.

Spencer, C.N., and F.R. Hauer. 1991. Phosphorus and nitrogen dynamics in streams during a wildfire. J. of North America Benthological Society. 10(1): 24-30.

Stacey, P.B. and A. Hodgson. 1995. Impact of a large natural wildfire on the Mexican spotted owl. J. of Wildlife Management.

Swetnam, T.W. and C.H. Baisan. 1996. Fire histories of the montane forests in the Madrean borderlands. Pages 18-21 *in* The Effects of Fire on Madrean Province Ecosystems. USDA USFS. Gen. Tech, Rept. RM GTR-289. Rocky Mtn. For. & Rang. Exp. Stn., Fort Collins, Colorado.

Tiedemann, A.R., C.E. Conrad, J. H. Dietrich, J. W. Hornbeck, W.F. Megahan, L.A. Viereck, and D.P. Wade. 1979. Effects of fire on water: a state of knowledge review. USDA USFS. WO GTR-10. Washington DC.

USDA and USDI. 1995. The Wildland and Prescribed Fire Management Policy: I mplementation and Procedures Reference Guide. National Interagency Fire Center, Boise, Idaho.

USFS. 1986. Coronado National Forest Plan.

-----. 1993. Coordinated Land Management Plan for El Coronado Ranch, Arizona.

-----. 1998a. Environmental assessment for the Johnson Peak Fire Management Plan. Coronado National Forest, Douglas Ranger District, Douglas, Arizona.

-----. 1998b. Biological assessment and evaluation for the Johnson Peak Fire Management Plan. Coronado National Forest, Douglas Ranger District, Douglas, Arizona.

-----. 1998c. Biological assessment and evaluation for the Coronado National Forest's ongoing and long-term grazing program. Coronado National Forest, Supervisor's Office, Tucson, Arizona.

-----. 1999a. Clarification letter from the Forest Service to the Service. Coronado National Forest, Douglas Ranger District, Douglas, Arizona.

-----. 1999b. Biological assessment for the Coronado National Forest's ongoing and long-term grazing program. Coronado National Forest, Supervisor's Office, Tucson, Arizona.

USFWS. 1984. Final rule to determine the Yaqui chub to be an endangered species with critical habitat, and to determine the beautiful shiner and the Yaqui catfish to be threatened species with critical habitat. Federal Register 49(171):34490-34497.

-----. 1988. Determination of endangered status for two long-nosed bats. Federal Register 53(190):38456-3860.

-----. 1990. Listed cats of Texas and Arizona Recovery Plan (with emphasis on the ocelot). USFWS, Regional Office, Albuquerque, New Mexico. 131pp.

-----. 1991. Mexican spotted owl status review. Endangered Species Rept. 20, Albuquerque, New Mexico.

-----. 1993. Final rule to list the Mexican spotted owl as threatened. Federal Register 58:14248-14271.

-----. 1994. Memorandum from the San Bernardino NWR to the Phoenix Field Office of Ecological Services, Phoenix, Arizona.

-----. 1995a. Rio Yaqui Fishes Recovery Plan. Prepared by San Bernardino and Leslie Canyon National Wildlife Refuges. Douglas, Arizona.

-----. 1995b. Mexican Spotted Owl (*Strix occidentalis lucida*) Recovery Plan. USFWS, Regional Office, Albuquerque, New Mexico.

-----. 1995c. MSO critical habitat proposed. FR 60:29914-29951.

-----. 1997a. Habitat Conservation Plan for the El Coronado Ranch, Arizona.

-----. 1997b. Lesser long-nosed bat Recovery Plan. USFWS, Regional Office, Albuquerque, New Mexico.

-----. 1998a. Revocation of Critical Habitat for the Mexican spotted owl, the loach minnow and spikedace. FR 63: 14378-14379.

-----. 1998b. Proposal to remove the American peregrine falcon from the Federal list of endangered and threatened wildlife, and to remove the similarity of appearance provision for free-flying peregrines in the conterminous United States. Federal Register 64:46542-46558.

-----. 1999a. Final rule to remove the American peregrine falcon from the Federal list of endangered and threatened wildlife, and to remove the similarity of appearance provision for free-flying peregrines in the conterminous United States. Federal Register 64:46542-46558.

-----. 1999b. Biological opinion for the Coronado National Forest's ongoing and long-term grazing program. USFWS, Phoenix, Arizona.

Van Devender, T.R. 1995. Desert grassland history: changing climates, evolution, biogeography, and community dynamics. Pages 68-99 *in* McClaran and T.R. Van Devender eds. The Desert Grassland. University of Arizona Press, Tucson, Arizona.

Varela-Romero, A., C. Galindo-Duarte, E. Saucedo-Monarque, L. S. Anderson, P. Warren, S. Stefferud, J. Stefferud, S. Rutman, T. Tibbitts, and J. Malusa. 1990. Re-discovery of *Gila intermedia* and *Gila purpurea* in northern Sonoran, Mexico. Proc. 1990 Desert Fishes Council 22:33.

Ward, J.P. Jr., and W.M. Block. 1995. Mexican spotted owl prey ecology, *in* The Mexican Spotted Owl Recovery Plan., USFWS, Regional Office, Albuquerque, New Mexico.

White, G.C., A.B. Franklin, and J.P. Ward, Jr. 1995. Population biology, *in* The Mexican Spotted Owl Recovery Plan. USFWS, Regional Office, Albuquerque, New Mexico.

Willey, D.W. 1993. Home range characteristics and juvenile dispersal ecology of Mexican spotted owls in southern Utah. Final Report 1992-93. Utah Dept. Wildlife Resources, Contract No. 91-2577, Amendment #1.

-----. 1997. Saguaro National Park. Personal communication. Tucson, Arizona.

Wright, H.A., and A.W. Bailey. 1982. Fire ecology, United States and Canada. Pages 138-155. John Wiley and Sons, New York.

APPENDIX C

Figures