United States Department of the Interior

FISH AND WILDLIFE SERVICE
California and Nevada Operations Office
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Sacramento, California 95825

IN REPLY REFER TO:
1-1-01-F-0033

January 11, 2001

Mr. Bradley Powell
Regional Forester-Pacific Southwest Region
1323 Club Drive
Vallejo, California 94592

Mr. Jack Blackwell
Regional Forester-Intermountain Region
Federal Building.
324 25th Street
Ogden, Utah 84401

Subject: Formal Endangered Species Consultation and Conference on the Biological Assessment for the Sierra Nevada Forest Plan Amendment Final Environmental Impact Statement

Dear Mr. Powell and Mr. Blackwell:

This is in response to your letter dated December 26, 2000, requesting initiation of formal consultation pursuant to section 7 of the Endangered Species Act of 1973, as amended (16 USC 1531 et seq.; Act). Your Revised Biological Assessment (RBA) for the Sierra Nevada Forest Plan Amendment Final Environmental Impact Statement (FEIS) was received by the U.S. Fish and Wildlife Service (Service) on December 20, 2000. The RBA addresses the effects of implementing a modified alternative 8 for the management of five problem areas identified in the Draft EIS on 11 National Forests in the Sierra Nevada, including the Modoc, Lassen, Plumas, Eldorado, Tahoe, Lake Tahoe Basin Management Unit, Carson District of the Humboldt-Toiyabe, Stanislaus, Sierra, Sequoia, and Inyo National Forests (proposed action). The Service has reviewed the Biological Assessment for the proposed, threatened and endangered species under our regulatory jurisdiction. Consistent with the "Memorandum of Agreement, Endangered Species Act Section 7 Programmatic Consultations and Coordination among Bureau of Land Management, Forest Service, National Marine Fisheries Service and Fish and

Wildlife Service, August 30, 2000", we have included candidate species in our biological opinion. Candidate species are species being considered by the Fish and Wildlife Service for listing as endangered or threatened species, but are not yet the subject of a proposed rule. This document represents the Service's biological opinion on the effects of the proposed action on 24 candidate, proposed, and listed species and critical habitats identified in Table 1.

Table 1. List of Species Included Within this Consultation.

Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*)	Threatened
Little Kern golden trout (*Oncorhynchus aguabonita whitei*)	Threatened
Little Kern Golden Trout Critical Habitat	Designated
California Golden Trout (*Oncorhyncus mykiss aquabonita*)	Candidate
Lahonton cutthroat trout (*Oncorhynchus clarki henshawi*)	Threatened
Paiute cutthroat trout (*Oncorhynchus clarki seleniris*)	Threatened
Owen's Tui Chub (*Gila bicolor snyderi*)	Endangered
Owen's Tui Chub Critical Habitat	Designated
Modoc sucker (*Catostomus microps*)	Endangered
Modoc sucker Critical Habitat	Designated
Lost River sucker (*Deltistes luxatus*)	Endangered
Lost River sucker Critical Habitat	Proposed
Shortnose sucker (*Chasmistes brevirostrus*)	Endangered
Shortnose sucker Critical Habitat	Proposed
Warner Sucker (*Catostomus warnerensis*)	Threatened
Warner Sucker Critical Habitat	Designated
California condor (*Gymnogyps californianus*)	Endangered
California condor Critical Habitat	Designated
Southwestern Willow Flycatcher (*Empidonax trailii extimus*)	Endangered
SW Willow Flycatcher Critical Habitat	Designated
Bald eagle (*Haliaeetus leucocephalus*)	Proposed (Delist)
California Spotted Owl (*Strix occidentalis occidentalis*)	Candidate
California Bighorn Sheep (*Ovis canadensis californiana*)	Endangered
Pacific Fisher (*Martes pennanti*)	Candidate
California red-legged frog (*Rana aurora draytonii*)	Threatened
California red-legged frog Critical Habitat	Proposed
Mountain yellow-legged frog (*Rana muscosa*)	Candidate
Yosemite toad (*Bufo canorus*)	Candidate
Mariposa pussy-paws (*Calyptridium pulchellum*)	Threatened
Springville clarkia (*Clarkia springvillensis*)	Threatened

Slender orcutt-grass (*Orcuttia tenuis*)	Threatened
Layne's butterweed (*Senecio layneae*)	Threatened
Greene's tuctoria (*Tuctoria greenei*)	Endangered

The Service has reviewed the RBA, FEIS, the draft Record of Decision (ROD), and the effects of the proposed action on the vernal pool fairy shrimp (*Branchinecta lynchi*),vernal pool tadpole shrimp (*Lepidurus packardi*), Shasta crayfish (*Pacifasticus fortis*), and the northern spotted owl (*Strix occidentalis caurina*) and concurs with your determination that the proposed action is not likely to adversely affect these species or adversely modify northern spotted owl critical habitat. Therefore unless new information reveals effects of the proposed action in a manner or to an extent not considered or a new species is listed no further consultation for these species is necessary.

After reviewing the RBA we do not concur with your determinations that the proposed action is not likely to adversely affect the California condor (*Gymnogyps californianus*), southwestern willow flycatcher (*Empidonax traillii*), Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), Mariposa pussypaws (*Calyptridium pulchellum*), Greene's tuctoria (*Tuctoria greenei*), slender orcutt grass (*Orcuttia tenuis*), Springville clarkia (*Clarkia springvillensis*) and Layne's butterweed (*Senecio laynei*). We have, therefore, included these species in this biological opinion for your consideration.

This biological opinion is based on the following information: (1) information presented in your RBA dated December 20, 2000; (2) the FEIS and draft Record of Decision (ROD); (3) information on file in the Service's Sacramento, Reno, Ventura, Klamath Falls, Portland and Carlsbad Field Offices; (4) a review of the relevant published literature on the species considered herein; (5) discussions with species experts familiar with the ecology of the species; and (6) numerous meetings, discussions, and telephone conversations that have occurred between our staffs during the production of the DEIS and FEIS. The Service has prepared this biological opinion in the absence of site specific and spatially explicit information on: (1) where the proposed activities for standards and guidelines and management prescriptions will be applied on the landscape; and (2) how the standards and guidelines, and their exceptions will be implemented. In the absence of this information this biological opinion reflects the ecologically most conservative estimate of effects for species and habitats contained in this biological opinion. A complete administrative record for this consultation is on file at the Sacramento Fish and Wildlife Office.

Because of the wide-ranging implications of the proposed action a stratified approach has been taken by the Service in an attempt to quantify and qualify the effects of the proposed action. This biological opinion covers the standards and guidelines in the FEIS and ROD as they relate to management of the five problem areas. It does not cover future site specific actions resulting from the proposed action, nor does it authorize incidental take for programmatic impacts associated with ongoing effects of other programs administered by the Forest Service.

The following assumptions regarding future consultation are incorporated into this programmatic biological opinion:

1) Analysis for site specific actions proposed under the "umbrella" of this programmatic management plan will be submitted to the Fish and Wildlife Service pursuant to section 7 of the Endangered Species Act.

2) Specific actions that the Forest Service or the Fish and Wildlife Service determine may affect listed species will undergo consultation according to section 7 (a) (2). These actions will be assessed on their own merits and be evaluated relative to the jeopardy and adverse modification criteria of the Act.

3) This biological opinion is based on the management strategy presented in the project description, in the FEIS, and in the Record of Decision. Therefore, the Fish and Wildlife Service will provide guidance on future proposed actions and their consistency with the project description and our biological opinion, in order to ensure that our determination in the biological opinion remains valid.

4) The condition, abundance, and distribution of listed and unlisted species and/or their habitat described in these documents is accurately described and will not substantially change from the conditions analyzed in this biological opinion. We anticipate that the current management proposal will result in improved habitat conditions for listed and unlisted species over the life of the proposed plan. However, circumstances may occur that result in effects not considered in this biological opinion. In such event, reinitiation of consultation for listed species may be necessary pursuant to 50 CFR 402.16. The agencies will also cooperate to evaluate the effects of changing circumstances on unlisted species.

The effects of ongoing impacts of actions listed above and actions resulting from the proposed action will be covered in future programmatic and site specific section 7 consultations on the listed and non-listed species covered in this biological opinion, therefore, incidental take is not authorized for these actions/processes by this biological opinion.

Consultation History

From July 1998 to present staff from the Sacramento Fish and Wildlife Office have been working in cooperation with the Forest Service on the development of the DEIS and FEIS. Service staff have: provided technical assistance in the development of alternatives; provided critical review of sections of the DEIS and FEIS; participated in numerous meetings with the interdisciplinary, science, design, and inter-agency teams; and assisted in the development of conservation strategies for non-listed species of concern.

On March 25, and April 23, 1999, staff met with Forest Service wildlife biologists and botanists respectively to discuss what species should be covered in the preparation of the biological assessment. On July 27, 1999, staff spoke with Forest Service botanists to further refine a list of species to be considered in the biological assessment.

On September 29, 1999, the Service sent an update species list to the Forest Service for its consideration in the preparation of their biological assessment of the proposed action. Updated species lists were also sent January 6, 2000, May 2, 2000, and an electronic version of a species list was electronically mailed on August 11, 2000.

On August 11, 2000, the Service provided comments on the DEIS (Service file no. ER-00/0410). In these comments the Service recommended the Forest Service incorporate comprehensive management strategies for old forest associated species and for aquatic dependent species. We also recommended that the Forest Service incorporate specific measures into the selected alternative that would ensure unlisted species do not trend toward a listing pursuant to the Act. We also recommended the plan include measures that would provide for the recovery of species that become listed. Finally, we recommended elements of a spatially explicit conservation strategy that would be completed and incorporated into the final selected alternative, and also provided elements that we believe would be necessary should the Forest Service choose not to proceed with a spatially explicit strategy.

Throughout December 2000, staff met with the Regional Forester to clarify and discuss outstanding information needs from the RBA, FEIS, and draft ROD in their preparation of this biological opinion. Outcomes of these meetings served to clarify information brought forward in the RBA from existing formal (previous consultations) and informal agreements between the Service and the Forest Service and are formalized in this biological opinion. Further, staff made numerous recommendations regarding necessary changes within the standards and guidelines and ROD for the Service to issue its biological opinion.

On January 3, 2001, staff spoke with the Forest Service regarding the development of a memorandum of understanding to address future consultation needs for the impacts of ongoing activities, included to but not limited to recreation, mining and grazing, and a phased approach for consulting on the individual Land and Resource Management Plans that currently are not covered by existing consultations. Staff agreed that this biological opinion would outline the scope and timing for these future consultations.

BIOLOGICAL OPINION

Description of the Proposed Action

A complete description of the proposed action can be found in the FEIS and the ROD. The following is a summary of the action from the FEIS and the ROD that was used to formulate this biological opinion.

The analysis area for the Sierra Nevada Forest Plan Amendment Project includes the following affected Forests: Modoc, Lassen, Plumas, Tahoe, Lake Tahoe Basin Management Unit, Eldorado, Stanislaus, Sierra, Sequoia, Toiyabe-Humboldt and Inyo National Forests. It encompasses portions of the following Counties: Alpine, Amador, Butte, Calaveras, El Dorado, Fresno, Inyo, Kern, Lassen, Madera, Mariposa, Modoc, Mono, Nevada, Placer, Plumas, Shasta, Sierra, Tehama, Tulare, Tuolumne, and Yuba in California and Humboldt and Toiyabe, in Nevada. A complete description of the Sierra Nevada ecoregion is presented in the FEIS. The proposed action only applies to Federally administered lands within the eleven affected Forests, but outside the portion of the northern spotted owl (*Strix occidentalis caurina*) range covered by the Northwest Forest Plan (1994).

The proposed action provides standards and guidelines for the resolution of range wide issues surrounding five problem areas identified in the November 1998, Notice of Intent to prepare an Environmental Impact Statement including: (1) old forest ecosystems and associated species; (2) aquatic, riparian, and meadow ecosystems and associated species; (3) fire and fuels; (4) noxious weeds; and (5) lower west side hardwood forests. New standards and guidelines for other forest activities were not developed for the final preferred alternative considered in the FEIS. Standards and guidelines and land allocations in existing Forest LRMPs not directly superseded by the preferred alternative will remain in effect.

The proposed action is a modification of Alternative 8 presented in the DEIS. Like Alternative 8, uncertainty about the possible effects of management activities on wildlife habitat is a dominant concern. The proposed action responds to concerns that potential impacts from vegetation and fuels management activities may pose greater risks to habitat for old forest dependent species than the risk posed by potential wildland fires. It acknowledges that existing habitats for certain at-risk non-listed species are in short supply, and therefore applies a cautious approach for managing vegetation and fuels in habitat for sensitive wildlife species. Management direction provided in the standards and guidelines is designed to address uncertainty that is inherent in large-scale management efforts such as this, and to increase confidence that management actions resulting from the proposed action will not preclude the future development of necessary recovery and/or conservation strategies for species found in the Sierra Nevada.

The proposed action attempts to balance species conservation needs while addressing the need to reduce the threat of large catastrophic fires and the associated loss of life, property and habitat. The proposed action provides a comprehensive fuels management strategy that will eventually allow for the reintroduction of fire into these fire adapted ecosystems and ensure the long-term viability of old forest, aquatic, riparian and meadow ecosystems and species associated with them.

The proposed action establishes a set of land allocations for the management of forested, aquatic, riparian, and meadow ecosystems, and identifies urbanized areas embedded in the forest matrix that may be at risk to catastrophic fires. This approach allows for the standards and guidelines and management prescriptions to be applied in a hierarchical fashion to ensure that the balance of maintaining viable ecosystems and reducing risks to human health and safety is achieved. The proposed action identifies several land allocations including: general forest; old forest emphasis areas; Southern Sierra Fisher Conservation Area; and aquatic, riparian and meadow conservation areas.

The proposed action recognizes the need to reduce the threat of fire to human communities by providing for more intensive fuel treatments in urban wildland intermix zones. Outside of these zones, direction for treating forest fuels is cautious, ensuring that treatments do not degrade habitat to the extent that future management options for listed species and non-listed species at risk are not foreclosed.

The proposed action is also designed to maintain long term viability of Forest Service sensitive species and contribute to the recovery of threatened, endangered, and proposed riparian species dependent on riparian and aquatic ecosystems, and ensure management activities do not contribute to population declines. Conservation assessments will be developed for several aquatic species (mountain yellow-legged frog, foothill yellow-legged frog, Yosemite toad, northern leopard frog, and willow flycatcher). These conservation assessments will synthesize the best available information, including life history, habitat associations, risk factors, and identify occupied and unoccupied habitats essential for the conservation of these species. This information will be incorporated into landscape analyses. Upon completion of these landscape analyses, restoration actions that contribute to species conservation will be developed, prioritized, and implemented.

A complete description of the proposed action can be found in the FEIS, RBA, and the ROD and is not included herein. However, the following standards and guidelines are what this biological opinion are based on, any deviation from these standards and guidelines will require the reinitiation of consultation. For the purposes of this consultation, standards and guidelines are divided into two categories: (1) standards and guidelines with measurable impacts; and (2) narrative standards and guidelines with immeasurable impacts.

The purposes of the proposed action is to:

- Protect, increase, and perpetuate old forest ecosystems and provide for the viability of native plant and animal species associated with old forest ecosystems;

- Protect and restore aquatic, riparian, and meadow ecosystems and provide for the viability of native plant and animal species associated with these ecosystems;

- Manage fire and fuels in a consistent manner across the national forests, coordinate management strategies with other ownerships, integrate fire and fuels management objectives with other natural resource management objectives, address the role of wild land fire, and set priorities for fire and fuels management actions;

- Reduce and, where possible, reverse the spread of noxious weeds; and
- Restore and sustain desired hardwood forest ecosystem conditions in the lower westside of the Sierra Nevada.

Status of the Species

Valley Elderberry Longhorn Beetle

On August 8, 1980, the valley elderberry longhorn beetle (beetle) was listed as a threatened species (45 **FR** 52803). Two areas along the American River in the Sacramento metropolitan area have been designated as critical habitat for the beetle. In addition, an area along Putah Creek, Solano County, and the area west of Nimbus Dam along the American River Parkway, Sacramento County, are considered essential habitat, according to the Recovery Plan for the beetle (USFWS 1984). These areas support large numbers of mature elderberry shrubs with extensive evidence of use by the beetle.

The beetle is dependent on its host plant, elderberry (*Sambucus* sp.), which is a common component of the remaining riparian forests of the Central Valley. Use of the plants by the beetle, a wood borer, is rarely apparent. Frequently, the only exterior evidence of the shrub's use by the beetle is an exit hole created by the larva just prior to the pupal stage. Recent field work along the Consumnes River and in the Folsom Lake area indicates that larval galleries can be found in elderberry stems with no evidence of exit holes; the larvae either succumb prior to construction of an exit hole or are not far enough along in the developmental process to construct an exit hole. Larvae appear to be distributed in stems which are 1.0 inch or greater in diameter at ground level. The *Valley Elderberry Longhorn Beetle Recovery Plan* (USFWS 1984) and Barr (1991) contain further details on the beetle's life history.

Population densities of the beetle are probably naturally low (USFWS 1984), and it has been suggested, based on the spatial distribution of occupied shrubs (Barr 1991), that the beetle is a poor disperser. Low density and limited dispersal capability may cause the beetle to be vulnerable to the negative effects of the isolation of small subpopulations due to habitat fragmentation.

Environmental Baseline

Valley Elderberry Lonhorn Beetle

Extensive destruction of California's Central Valley riparian forests has occurred during the last 150 years due to agricultural and urban development (Katibah 1984, Katibah et al. 1984, Smith 1977, Thompson 1961). Based on a 1979 aerial survey, only about 102,000 acres out of an estimated 922,000 acres of Central Valley riparian forest remain (Katibah et al. 1981). More extreme figures were given by Frayer et al. (1989), who reported that approximately 85 percent of all wetland acreage in the Central Valley was lost before 1939, and that from 1939 to the mid-1980s, the acreage of wetlands dominated by forests and other woody vegetation declined from 65,400 acres to 34,600 acres. Differences in methodology may explain the differences between the studies. In any case, the historical loss of riparian habitat in the Central Valley strongly suggests that the range of the beetle has been reduced and its distribution greatly fragmented. Loss of non-riparian habitat where elderberry occurs (e.g., savanna and grassland adjacent to riparian habitat, oak woodland, mixed chaparral-woodland), and where the beetle has been recorded (Barr 1991), suggests further reduction of the beetle's range and increased fragmentation of its upland habitat.

The beetle's current distribution is patchy throughout the remaining habitat of the Central Valley from Redding to Bakersfield. Surveys conducted in 1991 (Barr 1991) found evidence of beetle activity at 28 percent of 230 sites with elderberry plants present. The beetle appears to be only locally common, found in population clusters which are not evenly distributed across available elderberry shrubs. Frequently only particular clumps or trees in the study areas were found to harbor the beetle. Plants used by the beetle usually show evidence of repeated use over a period of several years, but sometimes only one or two exit holes are present. Similar observations on the clustered distribution of exit holes were made by Jones and Stokes (1987). Barr (1991) noted that elderberry shrubs and trees with many exit holes were most often large, mature plants; young stands were seldom occupied.

As stated above, two areas are designated as critical habitat for the beetle. The American River Parkway (Parkway), extending from Nimbus Dam to the confluence with the Sacramento River, represents a 22-mile long corridor of mixed riparian forest and grassland confined by flood-control levees and urban development along its entire length. Elderberry shrubs occur throughout this corridor. With the exception of levee maintenance, the Parkway is managed primarily for recreation, including a bike path. Evidence of use by the beetle can be found throughout the Parkway.

Within the project area, elderberry plants that may support the valley elderberry longhorn beetle are found in areas below 3,000 feet in elevation. A majority of the National Forests (El Dorado, Lassen, Mendocino, Plumas, Sequoia, Sierra, and the Stanislaus) addressed in the Sierra Nevada Forest Plan Amendment contain lands along the Central Valley foothills below 3,000 feet in elevation. These lands typically occur within major river drainages including but not limited to the American, Kern, Kings, San Joaquin, Tuolumne, and Yuba Rivers. Elderberry plants represent a subdominant species within interior live oak forests, interior live oak woodlands, blue oak woodlands, canyon live oak forests, mixed north slope forests, foothill pine/live oak/chaparral woodlands, northern mixed chaparral, interior live oak chaparral, and westside ponderosa pine forests in the project area. Elderberry plants occurring on Forest Service land that may provide habitat for the valley elderberry longhorn beetle represent less than five percent of the beetles known range.

To summarize, the Service believes that the beetle, though wide-ranging, is in long-term decline due to human activities which have resulted in widespread alteration and fragmentation of riparian habitats, and to a lesser extent, upland habitats, which support the beetle.

Status of the Species

Owens Tui Chub

The Owens tui chub (*Gila bicolor snyderi*) was federally listed as endangered and critical habitat was designated on August 5, 1985 (50 *Federal Register* 31592). Recovery goals for this species are contained in the Recovery Plan (Service 1998). The final rule listing the Owens tui chub as endangered describes its biology and reasons for its decline, including the introduction of non-native fish that affect Owens tui chub through competition, predation, and hybridization, and diversion and impoundment of water for agricultural and municipal use.

The Owens tui chub was described in 1973 as a subspecies of *Gila bicolor* endemic to the Owens Basin (Miller 1973). It is distinguished from its closest relative, the Lahontan tui chub (*G. b. obesus*), by scales with a weakly developed or absent basal shield, lateral and apical radii that number 13 to 29, the structure of its pharyngeal arches, the number of anal fin rays, gill raker counts of 10 to 14, and 52 to 58 lateral line scales (Miller 1973). Dorsal and lateral coloration varies from bronze to dusky green, grading to silver or white on the belly. It may reach a total length of 12 inches. Owens tui chub are believed to be derived from the Lahontan Basin tui chub that entered the Owens Basin from the north during the Pleistocene Epoch (Miller 1973, Smith 1978).

Early fish collections in the Owens Basin documented Owens tui chub in Owens Lake (Gilbert 1893), several sites along the Owens River from Long Valley to Lone Pine, tributary streams near the Owens River in Long Valley and Owens Valley, Fish Slough, and irrigation ditches and ponds near Bishop, Big Pine, and Lone Pine (Snyder 1917, Miller 1973). The scattered distribution of these localities and the ease with which researchers captured fish suggest that Owens tui chub were common and occupied all valley-floor wetlands near the Owens River in Inyo and Mono counties. Tui chub currently occupy many valley-floor habitats in the Owens River and its tributaries. However, few of these populations are genetically pure Owens tui chub. Few populations of unhybridized Owens tui chub are known to exist, and occur only where suitable habitat is isolated from non-native fishes (particularly Lahontan tui chub and predatory fish). Habitats occupied by non-introgressed Owens tui chub populations include the headsprings at Hot Creek Fish Hatchery (McEwan 1990), the Owens River downstream from

Crowley Lake (Jenkins 1990), ponds at White Mountain Research Lab near Bishop, ponds at Cabin Bar Ranch near Lone Pine, and Mule Spring. Owens tui chub populations also occur in Sotcher Lake, Madera County (Middle Fork San Joaquin River drainage), Silver Lake in the Mono Basin, Mono County, and Little Hot Creek, Mono County. The Sotcher Lake and Silver Lake populations are outside of the Owens tui chub native range, and they were probably established during fish stocking from Hot Creek Fish Hatchery, and may consist of Owens tui chub (Service 1998); it is unknown if they are pure stock. The population at Little Hot Creek was initially believed to be pure Owens tui chub, however, this population may have been compromised by hybridization with non-native chub as the result of an ineffective fish barrier.

Recent genetic and morphological studies failed to identify consistent differences among Owens tui chub, Lahontan tui chub, and Lahontan tui chub x Owens tui chub hybrids (Berg and Moyle 1992). Additional studies using more exact genetic techniques (e.g., mitochondrial DNA, polymerase chain reaction, etc.) are needed to determine reliable characteristics of pure Owens tui chub. Because of minor morphological differences between genetically pure and introgressed Owens tui chub, it is not currently possible to identify genetically pure Owens tui chub and estimate the amount of habitat they occupy. Although some of the populations mentioned above are believed to be genetically pure Owens tui chub, studies are necessary to confidently identify Owens tui chub and hybrid populations. To help resolve this dilemma, the CDFG received fiscal year 2000 funding under section 6 of the Act to determine genetic status and purity of selected Owens tui chub populations using taxon-specific molecular markers, and to compare the results with meristic and morphometric characterization using the original criteria with which the subspecies was described. This work will assess the genetic health of refuge populations, genetic purity of potential relict populations in natural habitats, and detect cryptic hybrids. This study will reveal the genetic health of remaining populations, lay a basis for monitoring future long-term genetic changes, and identify the best strategies and source populations for potential managed artificial gene flow. Diagnostic nuclear DNA characters will be developed using amplified fragment length polymorphism using nonlethal sampling of fin tissue. Meristic and morphometric characters will be determined using the original subspecies definition criteria. This information will resolve the current genetic uncertainties to allow reintroductions to occur. It is important to identify genetically pure populations of Owens tui chub and maintain the spatial distribution of each population. Thus, only pure Owens tui chub from the Owens River below Long Valley Dam should be maintained in the project area.

McEwan (1990) observed that Owens tui chub prefer pool habitats with low current velocities and dense aquatic vegetation that provide adequate cover and habitat for insect food items. Gut analyses showed that Owens tui chub also consume detritus and aquatic vegetation, which may be incidentally taken with insects.

Although only a few studies have examined the behavior, life history, and habitat use of the Owens tui chub, a number of aspects of its ecology can be generally surmised from studies of other tui chub subspecies. Tui chub congregate from late winter to early summer to spawn over aquatic vegetation or gravel substrate (Kimsey 1954). Females may produce a large number of eggs. Kimsey (1954) found that an 11 inch female from Lake Tahoe contained 11,200 eggs. Tui chub may reach sexual maturity at 2 years and may live more than 30 years (Scoppettone 1988).

Environmental Baseline

Owens tui chub

The recovery objectives, criteria, and recovery tasks for the Owens tui chub are presented in the Owens Basin Wetland and Aquatic Species Recovery Plan Inyo and Mono Counties, California (USFWS 1998). This multi-species recovery plan identifies 16 Conservation Areas of which 8 are essential for recovery of the Owens tui chub. These 16 Conservation Areas have been identified throughout the basin; these Conservation Areas are landscape units that include habitat for rare species, characteristic Owens Basin valley-floor wetland land forms and soils, and sufficient buffers to maintain ecological and geological processes necessary to protect aquatic and mesic alkali meadow ecosystems. They are also ecologically diverse and encompass habitats where rare species richness is highest, impacts of existing land and water uses are minimal, and chances for recovery of listed species and protecting candidate species are greatest. The eight conservation areas for the Owens tui chub are identified in the recovery plan as Little Hot Creek, Hot Creek, Round Valley, Fish Slough, Warm Springs, Mule Spring, Blackrock, and Southern Owens. The proposed action includes the Little Hot Creek and Hot Creek Conservation Areas.

Hot Creek and Little Hot Creek are owned, in part, by the Forest Service. The recovery plan recognizes that the creation and maintenance of small, often intensively managed, refuges (e.g., Hot Creek Hatchery and Little Hot Creek) have prevented extinction of Owens tui chub. The recovery plan directs that these refuges be maintained until both species have been securely reestablished in Conservation Areas identified in this plan. The priority order for establishing (securing) Conservation Area populations is as follows: 1) Little Hot Creek; 2) Hot Creek Hatchery; 3) Fish Slough; 4) Southern Owens, 5) Warm Springs, and 60 Round Valley.

Little Hot Creek Conservation Area lies at approximately 7,200 feet elevation in Long Valley and includes source springs of Little Hot Creek, its outflow, and bordering meadows. The spring source and much of the spring brook of this small Conservation Area lie within the Inyo National Forest; the downstream end of the site is owned by BLM and the Los Angeles Department of Water and Power. Little Hot Creek Conservation Area includes stream bank, moist flood plain, sodic meadow, and wet meadow. This aquatic habitat supports an Owens tui chub population that is currently restricted to Forest Service land. Recovery actions in this Conservation Area should include expanding Owens tui chub habitat, eliminating non-native fishes and installing an effective fish barrier to prevent upstream movement into Little Hot Creek, protecting spring discharge from adverse impacts of ground water pumping and geothermal development, protecting vegetation from excessive livestock grazing and restoring vegetation communities.

Management of the Little Hot Creek site should be consistent with achieving potential vegetation conditions as described by the NRCS Ecological Site Descriptions, the U.S. Bureau of Land Management's Desired Plant Community Definitions, and BLM documents on riparian zone proper functioning condition (U.S. Bureau of Land Management 1993 and 1995). In 1992, the Forest Service developed 12 small ponds downstream of the reservoir, and Owen's tui chub of unknown genetic purity have persisted in this habitat and in Little Hot Creek downstream. The reservoir and developed ponds are fenced from grazing by livestock (Antelope allotment). Current management direction defaults to the Biological Opinions (1-1-95-F-42, 1-1-94-F-40), which prescribes 30 percent annual use of herbaceous species and 20 percent annual use of woody species.

The Hot Creek Conservation Area lies at approximately 7,000 feet elevation in Long Valley and includes springs at CDFG's Hot Creek Fish Hatchery, Hot Creek, and adjacent meadows. Approximately 20 percent of this small Conservation Area is owned by the Los Angeles Department of Water and Power, 40 percent in on Forest Service land, and the remainder in privately owned. Hot Creek Conservation Area includes streambank, sodic meadow, moist floodplain, and wet sodic meadow. Recovery actions should rehabilitate and protect aquatic habitats, main spring discharge, and reintroduce endemic species. Sport fishing should not be affected by recovery actions in this Conservation Area. Fishing should be allowed to continue at current levels.

Critical habitat for the Owens tui chub exists along 8 miles of the Owens River and 50 feet of riparian vegetation on either side of the river, encompassing a total of approximately 97 acres in the Owens Gorge, at two spring provinces, including 50 feet of riparian vegetation on either side of spring brooks, encompassing approximately 5 acres at Hot Creek Fish Hatchery. Constituent elements of critical habitat for the Owens tui chub include high quality, cool water with adequate cover in the form of rocks, undercut banks, or aquatic vegetation, and a sufficient insect food base. Critical Habitat at Hot Creek Fish Hatchery is on land owned by the Los Angeles Department of Water and Power.

The action area occurs within Sierra Nevada and adjacent land including Long Valley which is located between the Sierra Nevada and White Mountains. Long Valley contains the two highest priority conservation areas for recovery of the Owens tui chub. Proposed actions will occur on National Forest Land throughout the Sierra Nevada, including areas identified as Conservation Areas in Long Valley. The action area currently possesses extensive breeding and nonbreeding habitat that is in immediate need of management actions including restoration, enhancement, and eradication of nonnative predators.

Status of the Species

Paiute cutthroat trout

The Paiute cutthroat trout (*Oncorhynchus clarki seleniris*) (PCT) was listed by the Service in 1970 (Federal Register Vol. 35, p. 13520) as endangered. Subsequently, PCT were reclassified as threatened in 1975 to permit a State regulated sport harvest of these fish (Federal Register Vol. 40, p. 29864). There is no designated critical habitat for PCT (Fish and Wildlife Service 1985).

The PCT has a very limited range of approximately 15.4 kilometers (km) of habitat within the Silver King Creek drainage where it is believed to have evolved from Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*) (LCT) during the last 5,000 to 8,000 years (Behnke and Zarn 1976). Silver King Creek is a tributary to the East Fork Carson River drainage of east central California in the Humboldt-Toiyabe National Forest. The presumed historic distribution of PCT is limited to Silver King Creek below Llewellyn Falls and the accessible reaches of three small tributaries: Tamarack Creek, Tamarack Lake Creek, and the lower 0.4 km of Corral Valley Creek. The issue of what constitutes the native range is complicated by the paucity of early collection records and the conflicting recollections of early observers. The situation is further clouded by one or more unofficial transplants and by natural events that may have altered the course of Silver King Creek.

The present distribution of PCT consists of a population in Silver King Creek above Llewellyn Falls; tributary populations in Fly Valley, Fourmile Canyon, Coyote Valley, and Corral Valley Creeks (Humboldt-Toiyabe National Forest, Alpine County) within the native drainage; and three self-sustaining populations outside the native drainage in the North Fork of Cottonwood Creek (Inyo National Forest, Mono County), Stairway Creek (Sierra National Forest, Fresno County), and Sharktooth Creek (Sierra National Forest, Madera County). The present status of two introduced populations in Delaney Creek (Yosemite National Park, Tuolumne County), and Cabin Creek (Inyo National Forest, Mono County) is not known. However, these populations are suspected of being either introgressed with rainbow trout, or reduced to such low levels that they may no longer be viable. The only known self-sustaining lake population, in Birchim Lake (Inyo National Forest, Inyo County), is introgresssed with rainbow trout. Paiute cutthroat trout now occupy a minimum of 32 km of stream habitat in four widely separated drainages. Other small, or potentially introgressed, populations may also persist in some of the other waters into which they were introduced.

Sometime after 1950, PCT in Silver King Creek above Llewellyn Falls became introgressed as the result of unintentional introductions of rainbow and LCT into the upper watershed by the California Department of Fish and Game (CDFG)(Somer, CDFG, pers. comm. 2000). Planting records indicate that 5,040 rainbow trout fry were stocked above Llewellyn Falls during September 1949. It is unclear when or where LCT were stocked above Llewellyn Falls. The PCT populations in Corral Valley and Coyote Valley were also introgressed with rainbow trout sometime during the 1950's from an unknown source.

Efforts to restore pure populations of PCT into these waters appear successful after multiple chemical treatments combined with removal of hybridized trout using electrofishing. A three-year chemical treatment project conducted during 1991 through 1993 successfully removed hybrid trout from Silver King Creek in Upper Fish Valley upstream from Llewellyn Falls. From 1994 to 1996, donor fish from Fly Valley and Coyote Creeks were used to repopulate the treated stream reach. The population of PCT in Fly Valley Creek remains isolated by falls which are a barrier. Hybridized trout were also removed from Fourmile Canyon Creek by electrofishing and chemical treatment during 1991 through 1993. Corral Valley Creek was chemically treated during 1964, and retreated during 1977 to remove hybridized trout. Electrofishing surveys were done following the 1977 treatment to eliminate the surviving hybridized trout. The chemical treatments of Coyote Valley Creek during 1964 and 1977 failed. However, retreatment during 1987 and 1988 appears successful because no hybrid trout have been observed during electrofishing surveys conducted since then.

Few studies have been completed on the biology of the PCT. Most of what is known is based on studies conducted by Wong (1975) and Diana (1975) on the introduced population in Cottonwood Creek, Mono County, California. The life history and habitat requirements for PCT appear to be similar to those reported for other western stream-dwelling salmonids. All life stages require cool, well-oxygenated waters. Adult fish prefer stream pool habitat in low gradient meadows. Paiute cutthroat trout can survive in lakes, but there is no evidence that they ever occurred naturally in any of the lakes within the Silver King basin. To spawn successfully, they must have access to flowing waters with clean gravel substrates (U.S. Fish and Wildlife Service 1985).

Paiute cutthroat trout reach sexual maturity at age two. Peak spawning activity occurs in June and July (Wong 1975). The eggs hatch in six to eight weeks and the fry emerge from the gravel in another two to three weeks. Young-of-the-year fish often move into intermittent tributary streams until they reach about 50 millimeters in length (Diana and Lane 1978). The number of body spots has traditionally been used to separate PCT and LCT (rarely more than 5 spots on PCT, versus greater than 50 spots on LCT) but this characteristic is unreliable.

Paiute cutthroat trout are opportunistic feeders, utilizing whatever aquatic and terrestrial invertebrates occur in the drift. They set up dominance hierarchies and defend these areas (Wong 1975). The largest fish typically occupy pools while smaller fish utilize runs and riffles and whatever other unoccupied habitats are available. Growth rates vary with water temperature and the abundance of food organisms. In stream environments PCT seldom reach sizes in excess of 25 centimeters (cm) total length (Moyle 1976), except in Silver King Creek were they attain a maximum size of 30 cm (McAfee 1966). In lakes they may grow to 45 cm or more (Ryan and Nicola 1976).

Livestock grazing practices and recreation developments pose threats to PCT within its range. In the past hybridization with rainbow trout has reduced the pure stock of PCT and remains a serious cause for concern. The threat of an unauthorized introduction from fish below Llewellyn Falls will remain until nonnative fish are removed and PCT are reestablished below the falls.

Environmental Baseline

Paiute cutthroat trout

Most of the streams in which PCT occur flow through land which is owned or controlled by the U.S. Forest Service. The native range of PCT is limited to Silver King Creek watershed which lies within the Humboldt-Toiyabe National Forest portion of the Carson-Iceberg Wilderness. Introduced populations of PCT also occur in North Cottonwood Creek, in the Inyo National Forest, and in Stairway and Sharktooth Creeks in the Sierra National Forest.

Data analyzed by the Intermountain Research Station (Overton, et al. 1993) show that desired future conditions for PCT streams include establishing deeper, narrower channels. To achieve this, lateral bank erosion must be greatly reduced, streambank vegetation must be established to capture sediments and build banks, and in channel sedimentation must be decreased. Increasing bank stability with wet meadow type vegetation is the prerequisite to achieving these goals. These changes will lead to increased bed scour and a deeper channel with undercut banks and increased pool quality. Increasing bank stability with wet meadow type vegetation is the prerequisite to achieving these goals.

The most valuable cover for stream populations of cutthroat trout is provided by undercut banks, which depend for their stability on extensive vegetative cover (Behnke and Zarn 1976). Streambank sloughing occurs as the result of normal erosive forces (floods, channel realignment, etc.) but can be accelerated by human or man-caused activities (off-road vehicle use, grazing, logging, etc). Heavy recreational use by anglers and backpackers can also result in streambank degradation. Streambank sloughing results in the loss of instream cover, increased water temperatures, streambed sedimentation, elimination of spawning habitat, and reduced food supplies. Livestock grazing and trailing along overhanging banks can weaken the stream banks and cause the margins to slough off into the stream. Livestock grazing in the riparian zone also retards the growth of willows and aspen along the stream bank. Reduced cover can lead to increased water temperatures.

In the Silver King Creek drainage, the Fourmile, Upper Silver King and Fly Valley Creeks are subject to periodic large natural events which can cause substantial changes and affect these streams for long periods of time. Examples include recent large avalanches in Fourmile and Fly Valley Creeks and a landslide in Upper Silver King Creek during 1983-1984 that may have added significant quantities of sediment into Silver King Creek.

Beaver control and habitat restoration were accomplished during the early to mid 1980's in the Silver King Creek basin above Llewellyn Falls. Beavers have been extirpated in the vicinity of the confluence of Fly Valley and Silver King Creeks and also in Fourmile Canyon Creek. Beaver dams were subsequently breached in both locations. Extensive stream restoration work, including rerouting the stream channel, was accomplished in Fourmile Canyon Creek. Beaver were noted in past years in Tamarack and Snodgrass Creeks. The current status of these populations is unknown.

The Silver King Cattle and Horse Allotment was heavily grazed by livestock over the last 100 years, first by large numbers of sheep and later by cattle. Traditionally this range was been used season-long for most of its grazing history. This type of heavy grazing pressure, when individual plants are re-grazed during the growing season does not allow adequate recovery after the grazing and over time significantly alters entire plant communities. Desired future conditions for the recovery of this species are described in the Paiute Cutthroat Trout Recovery Plan (U.S. Fish and Wildlife Service 1985), the Toiyabe National Forest's Land and Resource Management Plan, and the Allotment Management Plan for the Silver King C&H Allotment. The allotment has been rested from grazing since 1995; monitoring efforts indicate that streambank areas are improving in bank stability, ecological status, and plant vigor (Shanley, USFS, per. comm., 2000).

Recreation on federal lands can also adversely impact PCT and their habitats. Camping along springs and streams impacts riparian vegetation and streambank stability. Recreational use includes hiking and camping, both on foot and on horseback. Popular trails cross Corral, Coyote and Silver King Creeks. In Coyote Valley, the trail is contributing sediment to the stream system. Campers do select sites along some streambank areas, but they generally choose stable sites away from creeks. An additional impact could be illegal fishing activities involving a direct take of the species.

Paiute cutthroat trout hybridize readily with rainbow trout and with other subspecies of cutthroat trout. In the Silver King Creek drainage, Llewellyn Falls is an effective fish barrier which has kept other trout from invading PCT waters. Even with effective barriers, there is an ever-present risk that unconcerned individuals will transfer nonnative trout above the falls. The threat of an unauthorized introduction of trout below Llewellyn Falls will remain until nonnative fish are removed from PCT's historic range and PCT are reestablished below the falls.

The Cottonwood Creek drainage has two grazing allotments that have the potential to affect PCT habitat. The Cottonwood Creek has experienced past degradations from grazing activities. These are the Cottonwood Creek Allotment and the Tres Plumas Allotment which are currently closed to grazing (Riley, USFS, per. comm. 2000). The introduction of exotic trout species continues to be a concern in the Cottonwood Creek drainage. Brook trout and rainbow trout are present in the drainage below occupied PCT habitat. The Service, FS, and the CDFG are reviewing plans to add an additional barrier to North Cottonwood Creek to provide more protection to PCT.

Lands adjacent to Stairway Creek are not being grazed and a limited amount of grazing occurs along Sharktooth Creek in the Sierra National Forest (Eddinger, USFS, per. comm. 2000).

Introduced nonnative trout species are currently not a threat in these drainages (Eddinger, USFS, per. comm. 2000).

Status of the Species

Lahontan cutthroat trout

The Lahontan cutthroat trout was listed by the Service in 1970 as endangered (Federal Register Vol. 35, p. 13520). Subsequently, LCT were reclassified as threatened in 1975 to permit a State regulated sport harvest of these fish (Federal Register Vol. 40, p. 29864). There is no designated critical habitat for LCT (Fish and Wildlife Service 1995). LCT is an inland subspecies (one of 14 recognized subspecies of cutthroat trout in the Western United States) of cutthroat trout endemic to the Lahontan basin of northern Nevada, eastern California, and southern Oregon.

Lahontan cutthroat trout historically occurred in most cold waters of the Lake Lahontan basin, including: 1) Large alkaline terminal lakes; 2) major river systems, mountain streams, and lakes; and 3) small tributary streams. Prior to the turn of the century, there were 400 to 600 fluvial LCT populations in about 3,700 miles of streams and 11 lacustrine populations occupying about 334,000 acres of lakes within the basins of Pleistocene Lake Lahontan (Gerstung 1986). The Service has determined, based on geographical, ecological, behavioral, and genetic factors, that three distinct population segments (DPSs) of LCT exists. These include: 1) Western Lahontan basin comprised of the Truckee, Carson, and Walker River basins; 2) Northwestern Lahontan basin comprised of the Quinn River, Black Rock Desert, and Coyote Lake basins; and 3) Humboldt River basin (Fish and Wildlife Service 1995). The proposed action is within the headwaters of the Truckee, Carson, and Walker River basins; therefore this evaluation is specific to the Western Lahontan basin DPS.

Major reasons for the decline of LCT abundance and impacts to habitat throughout its range include: 1) Reduction in and alteration of stream discharge; 2) alteration of stream channels and morphology; 3) water quality degradation; 4) lake level reduction and concentration of chemical components in lakes; and 5) non-native fish introductions (Fish and Wildlife Service 1995).

Currently, range wide, self-sustaining LCT remain in only 10.7 percent (404 miles) of their probable historic stream habitat and 0.4 percent (1,290 acres) of their probable historic lake habitat (Fish and Wildlife Service 1995). Self-sustaining LCT lacustrine populations currently exist only in Independence Lake, California in the Western Lahontan basin and in Summit Lake, Nevada in the Northwestern Lahontan basin, both high elevation lakes. Non-sustaining lacustrine populations also occur in Walker and Pyramid Lakes, located in the Western Lahontan basin. Both Walker and Pyramid Lakes provide unique terminal lake ecosystems and are needed for recovery of the Western Lahontan basin DPS. Reconnecting LCT with historical spawning and stream habitat available in the Walker River and Truckee River basins would begin the process of reestablishing two additional lacustrine populations in true terminal lakes within its historic range.

LCT are obligatory stream spawners. Spawning generally occurs in riffle areas over gravel substrate from March through July, depending on stream flow, elevation, and water temperature (La Rivers 1962; McAfee 1966; Lea 1968; Moyle 1976). Lahontan cutthroat trout spawning migrations have been observed in water temperatures from 5 to 16° C (41 to 61° F) (Lea 1968; Fish and Wildlife Service 1977; Sigler et al. 1983; Cowan 1983). Individuals mature between 2 and 4 years of age and may live as long as 5 to 9 years. Post-spawning mortality rates as high as 90 percent have been reported for LCT (Cowan 1982). Consecutive year spawning appear to be uncommon.

Lahontan cutthroat trout occurred throughout the Truckee River basin in Nevada and California. Gerstung (1986) estimated 360 miles of stream habitat and 284,00 acres of lake habitat existed before non-Indian settlement within the basin. Historically, lacustrine populations were present in Lake Tahoe and in Pyramid and Independence Lakes. Currently, seven stream populations occupy about 8 miles of habitat comprising approximately 2.2 percent of the historic stream distribution. Occupied streams include: Pole, West Fork Gray, Hill, Deep Canyon, Bronco and Independence Creeks, and the Upper Truckee River. The only self-sustaining lacustrine LCT Truckee River population occurs in Independence Lake in Sierra County, California.

In the Walker River basin, LCT historically occurred in Walker Lake and its tributaries upstream to Pickle Meadows, California, in the West Fork of the Walker River, and upstream to Bridgeport Valley, California in the East Fork of the Walker River. Approximately 360 miles of stream habitat and 49,400 acres of lake habitat were occupied. Walker Lake and Upper and Lower Twin Lakes supported the only lacustrine populations (Gerstung 1986).

In 1995, the Walker River basin supported five self-sustaining areas of LCT. The only endemic population occurs in By-Day Creek, a tributary to the East fork of the Walker River in California. The other four self-sustaining areas are results of introductions into Bodie, Mill, Murphy, and Slinkard Creeks; these four creeks may not have been historic habitat. They are upstream of barriers and likely out of historic range. Bodie Creek is suspected of being introgressed with rainbow trout (Wong, CDFG, pers. comm. 2000). Data extrapolated from Gerstung (1986) indicate 11 miles of suitable habitat are occupied by LCT; this represents 3.1 percent of the historic habitat within the basin (Fish and Wildlife Service 1995). Two additional populations have recently been established in Wolf and Silver Creeks (Wong, CDFG, pers. comm. 2000).

Historically, in the Carson River basin, LCT distribution included most of the drainage downstream from Carson Falls, California, on the East Fork, and Faith Valley, California, on the West Fork. Within the basin small populations have been introduced into headwater streams of the Carson River: East Fork Carson Canyon, Murray Canyon, Poison Flat, Raymond Meadows, Golden Canyon, and Heenan Creeks. Gerstung (1986) indicates that LCT occupy about 9 miles of habitat comprising 3.0 percent of historic range in the Carson basin.

A number of documented out-of-basin LCT populations occur in California. Their importance for recovery of LCT will be determined in the near future. These populations include the following streams: Macklin and East Fork Creeks and an unnamed tributary to the East Fork Creek in the Yuba River system; Disaster Creek in the Stanislaus River system; Marshall Canyon and Milk Ranch creeks in the Mokelumne River system; West Fork Portuguese and Cow creeks in the San Joaquin River system; and O'Harrel Creek in the Owens River system. Macklin and East Fork Creeks population were derived from original Lake Tahoe Basin LCT and the O'Harrel Creek population appears to be of Walker Basin origin.

Environmental Baseline

Lahonton cutthroat trout

Lahontan cutthroat trout occupy a wide range of habitat types and conditions, but degradation of habitat from improper livestock grazing is a contributing factor in the decline of the species. Other factors that historically influenced the decline in the species include: 1) Hybridization, predation, and competition with introduced species; 2) commercial fishing; 3) blockage of migrations and genetic isolation due to diversion dams and other impassable structures; 4) degradation of habitat due to logging, road construction, irrigation practices, recreational use, channelization, and dewatering due to irrigation and urban demands; 5) changes in water quality and water temperature; 6) urbanization; and 7) grazing. The effects of many of these actions continue today.

Throughout the project area historic grazing has occurred, first by large numbers of sheep and later by cattle. Over time, entire plant communities change as a result of this grazing pressure. Livestock grazing has affected riparian areas by changing, reducing, or eliminating vegetation, compacting soils, trampling streambanks, and by loss in riparian areas through channel widening, channel degradation, or lowering of the water table. Localized contamination of surface water has occurred from grazing on the Meiss Meadows Allotment were fecal coliforms have been detected.

Recreation on federal lands can also adversely impact LCT and their habitats. Camping along springs and streams impacts riparian vegetation and streambank stability. Recreational use includes hiking and camping, both on foot and on horseback. Popular trails, such as the Pacific Crest Trail along the Upper Truckee Meadows, contribute sediment to the stream system. Campers generally choose stable sites away from creeks. An ongoing threat continues to be recreationists leaving gates open that allow cattle access to areas that are not authorized for grazing.

Hybridization and competition from non-native trout are a significant threat to recovery of the species. Lahontan cutthroat trout hybridize with rainbow trout. The Nevada and California State agencies continue to stock rainbow and brown trout throughout the range of the species. Brook trout, although no longer stocked, are present in many streams throughout LCT range. In many drainages, barriers kept non-native trout from invading LCT waters. Even with effective barriers, there is an ever-present risk that unconcerned individuals will transfer other non-native trout above the barriers. The threat of an unauthorized introduction of non-native trout will remain until nonnative fish are removed from LCT's historic range and LCT are reestablished below the barriers.

Historic mining has affected the aquatic environment by producing sediment, changes in pH, toxic heavy metals, and alteration of stream channels and water flows. Leviathan Mine, located along on the East Fork of the Carson River, continues to degrade historic LCT habitat.

The Service is in the process of revising the 1995 Recovery Plan for the Lahontan Cutthroat Trout. As part of the recovery effort, technical teams have been assembled to develop restoration and recovery plans for the Truckee and Walker River basins. A primary purpose of the plan are to identify and prioritize actions for the improvement of ecosystem function to facilitate the restoration/recovery of LCT. The Service believes that the establishment of lacustrine populations in Pyramid and Walker lakes is necessary for the recovery of LCT in the Western DPS.

The Truckee River Restoration and Recovery Implementation Team (TRRIT) is in the process of establishing recovery objectives for various reaches of the Truckee River and its tributaries. Important recovery areas which the TRRIT has initially identified as having immediate potential include: Independence Creek, upstream of Independence Lake; Pole Creek; Hunter Creek; Donner Creek; Perazzo Creek; Prosser Creek; and the Truckee River from it's confluence with Donner Creek to the State line; Upper Truckee River; Truckee River from Tahoe Dam to Donner Creek; Independence Creek downstream from Independence Lake to the Little Truckee River; and Coldstream Creek.

Degradation of LCT habitat in the Truckee River basin commenced in the early 1860's with logging activities (Townley 1980). Until about 1930, industrial and sewage wastes were dumped directly into the Truckee River (Sumner 1940). The Lake Tahoe LCT fishery disappeared in 1939 as a result of the combined effects of overfishing, introductions of non-native species, and damage to spawning habitat caused by pollution, logging, irrigation diversions, and barriers (Gerstung 1988). By 1944, the original Pyramid Lake LCT population was extirpated (Townley 1980) as a result of Truckee River water diversion at Derby Dam (built in 1904) for the Newlands Project, pollution, commercial harvest, and the introduction of non-native species (Sumner 1940; Knack and Stewart 1984).

During the last hundred years several major reservoirs were created and lakes dammed to provide for a variety of down stream uses. These structures are barriers for fish passage to historic LCT spawning grounds. Lake Tahoe dam was built in 1874, Donner Lake Dam, and Independence

Lake Dam were built in the 1930's and 1939 respectively; Martis Creek Reservior was built in 1971, Prosser Creek Reservoir in 1962, Stampede Reservoir in1970, and Boca Reservoir in 1937.

Through 1960, LCT populations within the current project area in Truckee River basin were limited to Pole Creek, Independence Lake and it's upstream tributary Independence Creek, all occurring within the Tahoe National Forest. By the early 1980's, introduction efforts were initiated to establish populations in West Fork Gray, Bronco, and Pole Creeks. The population status of Gray and Bronco Creeks are unknown at this time. The population in Pole Creek is above 2 natural barriers. The LCT population in the Upper Truckee River, an upstream tributary to Lake Tahoe, was established in the early 1990's (Lake Tahoe Basin Management Unit).

The presence of nonnative trout species continues to pose a threat to LCT populations throughout the Western DPS. LCT populations in the Western DPS are relegeted to headwater areas. They were stocked into historically fishless areas above barriers to avoid impacts from nonnative species. Rainbow and brown trout are presently stocked throughout the mainstems of the Truckee, Walker, and Carson Rivers by the Nevada Division of Wildlife (NDOW) and the California Department of Fish and Game (CDFG). The CDFG, through the TRRIT process has agreed to eliminate stocking the Truckee River from Lake Tahoe Dam to Donner Creek. The CDFG is actively removing brook trout which co-occur with LCT in the Upper Truckee River.

The Walker River Restoration and Recovery Implementation Plan for the Walker River will also recommend priority areas using a process similar to the TRRIT. At this time, the Walker River basin may have a greater potential for providing LCT access to habitat within the basin than the Truckee River basin due to fewer physical barriers, a smaller human population with no major cities along the river, and greater opportunity to restore the riparian corridor.

The California Department of Fish and Game (CDFG) regulates harvest of LCT in waters of California. No fishing is allowed in By-Day, Bodie, Mill, Murphy, Wolf and Silver Creeks. Slinkard Creek is open to limited season catch-and-release fishing with artificial flies (Wong, CDFG, pers comm. 2000).

Lahontan cutthroat trout populations within Slinkard, Mill, and By-Day Creeks are found on lands owned by CDFG; no grazing is allowed. Wolf and Silver Creeks are currently being rested from grazing. Grazing within the Murphy Creek area is continuing with little degradation to LCT habitat due to restrictive grazing measures.

Within the Carson River basin, self-sustaining LCT populations no longer occupy historic habitat (Gerstung 1986). The populations in East Fork Carson River, Murray Canyon, Poison Flat, Raymond Meadows, Golden Canyon, and Heenan Creeks were established by transplanting indigenous LCT beyond barriers or by stocking hatchery-reared LCT predominately of Carson River origin (Gerstung 1988).

Status of the Species

Little Kern Golden Trout

The Little Kern golden trout *(Oncorhynchus aguabonita whitei)* (GT-LK) was federally listed as threatened and critical habitat was designated concurrently on April 13, 1978 (43 **FR** 15427) (USFWS 1978). Critical Habitat consists of the entire Little Kern River basin upstream from a barrier falls located one mile below the mouth of Trout Meadows Creek. The CDFG has prepared a management plan that has been accepted by the Service as the official recovery plan for Little Kern golden trout. The fishery objectives for conditions within the proposed project boundaries are restoration of pure strain Little Kern golden trout to its critical habitat, protection of critical habitat, and protection and/or restoration of the native Sacramento sucker (*Catostomus occidentalis*).

Little Kern golden trout have bright red to red-orange bellies and cheeks, bright gold lower sides, red-orange lateral bands, deep olive green backs, and profuse spots on their backs and tails. They are native to the Little Kern River and its major tributaries. Although this watershed is entirely within the boundaries of Sequoia National Park and Sequoia National Forest in Tulare County, California, a few small, private inholdings exist in Sequoia National Forest. The Little Kern golden trout is also found in areas outside of its historical range (such as Coyote Creek, Sequoia National Park) as the result of unauthorized "coffee pot" transplants.

Little Kern golden trout require diverse habitats composed of pools, instream cover, shade from bankside vegetation, and gravel substrates for spawning. Ideal habitat includes deep, narrow channels in low gradient meadow environments. In these environments suitable habitat is characterized by low width to depth ratios and a large percentage of undercut banks. Boulders and cobbles are important cover habitats in areas without meadows. Trout forage on a variety of invertebrates, eating whatever is most abundant in the water column. Diet includes larval and adult insects and planktonic crustaceans (Moyle 1976).

Transplants of non-native trout into the Little Kern River basin displaced Little Kern golden trout from much of their historical range. By the 1980's fewer than 5,000 Little Kern golden trout existed in less than 11 miles of streams within the Little Kern River basin. Hybridization between Little Kern golden trout and rainbow trout was observed by the early 1940's, but due to impassable fish barriers common throughout the Little Kern River basin, isolated populations of genetically pure Little Kern golden trout persisted.

At the time the species was listed, major threats to the survival of the species were identified as: 1) habitat modification due to logging, roads, off-road vehicles, mineral extraction, and livestock; and 2) the effects of introduced trout. Since 1978, heavy angling pressure and disease have also been identified as major threats. By the late 1990's, recovery efforts by CDFG, U.S. Forest Service, and National Park Service had achieved their goal of eliminating non-native trout in approximately 90 miles of stream habitat and eight lakes within the Little Kern River basin. Recovery goals of restoring genetically pure GT-LK to these areas were on the verge of being attained when genetic impurities were detected in two areas causing a major setback. In one of these areas, illegal introduction of non-native trout was believed responsible. In the other, some GT-LK hatchery broodstock used to restock the area may have been genetically impure. As of the end of 1998, results of genetic testing to determine the extent of genetic contamination were still pending.

Environmental Baseline

Little Kern golden trout

Critical habitat for the GT-LK occurs predominately within the Golden Trout Wilderness of Sequoia National Forest. Additional GT-LK critical habitat occurs within the boundaries of Sequoia National Park and the Giant Sequoia National Monument. Only GT-LK populations that occur on Forest Service lands would be affected by the proposed action.

Ongoing activities continue to affect GT-LK and their habitat include livestock grazing, nonnative fish eradications, recreation including hiking trail creation and maintenance, camping, and fishing. There are two grazing allotments- the Little Kern and Jordan- that currently operate within Little Kern golden trout critical habitat. These allotments have been grazed for over 100 years, initially by sheep and currently by cattle. The use of the Little Kern allotment in critical habitat allows grazing by 225 cow/calf from June 6 to July 15, outside of critical habitat from July 15 to August 15. Livestock grazing on the Jordan allotment is permitted from August 15 to September 15 with the portion of the allotment that occurs within critical habitat, excluded from grazing. The following conditions are in effect for both allotments: (1) streambank alteration is permitted on no more than 10 percent of the stream reach, (2) willow utilization will not exceed 20 percent of current year leader growth; (3) allowable use levels on herbaceous vegetation will not exceed 40 percent and no more that 20 percent on woody species.

The CDFG has been involved in an intensive program to eradicate the non-native fish species within the Little Kern River system. Over the last 25 years, treatment with antimycin or rotenone (fish toxicants) have been used to treat many of the streams, lakes, and a portion of the Little Kern River. Populations of pure strain GT-LK are now inhabiting many of the treated sections of streams and lakes. In the past five years, the CDFG has repaired two fish barriers near the Rifle Creek drainage to prevent the encroachment of introduced fish into GT-LK habitats (Stephens pers. comm. 2001). CDFG is also evaluating two potential barrier sites near Soda Springs and along the lower Little Kern River (Stephens pers. comm. 2001).

Timber harvests have occurred in the Little Kern River watershed, but all of the watershed is currently within wilderness, national monument or national park status and no new timber harvests are planned. A Forest Service cumulative watershed effects analysis to determine effects from roads, timber sales and other activities has not been performed for this drainage. It is possible that natural events alone may create marginal conditions for trout production due to naturally occurring levels of sediments and warm water temperatures. Additional significant sediment introductions from outside influences may impact salmonid reproduction and survival.

Fifty miles of existing trails and eight miles of existing road are within critical habitat for the Little Kern golden trout. There are approximately 50 stream crossings within critical habitat, some of which bisect meadows. Many popular trails cross streams within critical habitat and contribute additional sediment to the system. The effects of these impacts appear to be minor although there are some stream crossings and trail locations that are negatively affecting local stream areas.

Recreational use varies from low use above the confluence of Mountaineer Creek and the Little Kern River, to high use near Fish Creek, along the Little Kern River, Grey Meadow area, Click's Creek, and along the trails leading to Lion Meadow. Hiking and camping are the dominant uses both on foot and horseback. Fishing pressure is generally light along many of the smaller streams and heavier along the Little Kern River (Bill Deisman pers. comm.). Many popular trails cross streams within critical habitat, contributing sediment to the system. Campsites in close proximity to a water source are preferred by most visitors, but generally speaking they are stable sites with minimal impacts to streambanks. Impacts to the species are most likely to be seen in the smaller streams where illegal fishing activities (over the 5 fish limit) could deplete recovering populations.

Status of the Species/Environmental Baseline

California Golden Trout

The California golden trout (*Oncorhynchus mykiss aguabonita*) (CGT) is recognized as a Species of Special Concern by the Service. It was designated by the Forest Service as a sensitive species in June 1998. A conservation strategy to protect and restore CGT populations was signed on April 22, 1999, by the Inyo National Forest, the California Department of Fish and Game and the U.S. Fish and Wildlife Service.

The historic range of California golden trout includes two watersheds draining the Kern Plateau of the southern Sierra Nevada mountains in California, Golden Trout Creek (a.k.a. Volcano Creek) and the South Fork of the Kern River. Other populations of this sub-species (of varying genetic integrity) exist throughout the western United States due to its transplantation. Presently, pure CGT populations occur solely within the boundaries of the Golden Trout Wilderness in Golden Trout Creek and along the South Fork Kern River upstream of the Templeton barrier at the downstream end of Templeton Meadow. The only other species of fish indigenous to the native range of CGT is the Sacramento sucker *(Catostomus occidentalis)*.

The CGT utilizes small high mountain streams with short growing seasons which accounts for its relatively low growth rate (Knapp and Dudley 1990). Native stream dwelling populations can live up to 9 years (Moyle et al. 1995). CGT reach sexual maturity at three to four years of age. They spawn in gravel riffles in streams when water temperatures reach 7-10 degrees Celsius, usually in late June or July (Moyle et al. 1995). California golden trout feed on both adult and larval aquatic and terrestrial insects.

Threats to the conservation of CGT within its historic range can be grouped into two categories, non-native fish introduction and habitat degradation. Of the two, the greatest risk to CGT is from the effects of non-native fish, primarily hybridization, predation, and interspecific competition for food and space. Hybridization with close relatives such as rainbow trout *(O. mykiss)* dilutes the fundamental genetic character of CGT, resulting in changes as easily observed as spotting pattern to those less detectable, such as protein or DNA composition, which require molecular analysis. Introduction of brown trout *(Salmo trutta)* has increased mortality via predation and competition for resources. Competition for resources essentially leads to a less profitable energy budget for CGT due to the reduction in quantity and quality of available forage and habitat.

Much like the GT-LK, the CDFG has been involved in an intensive program to eradicate the non-native fish species within the California golden trout system. In 1999, the CDFG conducted a chemical treatment of Movie Stringer which flows into the South Fork Kern River at Templeton Meadows (Stephens pers. comm. 2001). A followup treatment is proposed for this year. Additional activities proposed in CGT habitat includes that the repair of Schaeffer barrier in 2002 and further chemical treatments beginning in 2003 (Stephens pers. comm. 2001).

Less obvious are the sub-lethal effects of diminished resources due to interspecific competition. Where CGT are forced to occupy habitat in streams with faster water and less forage, their energy budget is reduced and growth retarded, increasing the probability of mortality when normal disturbance events (winter icing, floods, evasion of native predators) occur. Sub-lethal effects are compounded when native habitat is degraded. Habitat degradation has occurred within the native range of CGT, primarily as the result of livestock grazing in meadows. Degraded habitat in meadow streams includes the loss of undercut streambanks, wider and shallower channels, and increased levels of fine sediment in streams that has reduced pool depths and the interstitial spaces between cobbles and larger gravels.

Decreases in habitat quantity and quality impact individual fish and populations cumulatively. Loss of cover such as undercut banks increases the vulnerability of CGT to predation, while shallower pools reduce the quality of overwintering habitat and growth potential, again raising mortality. Increased rates of streambank erosion and fine sediment deposition do not appear to have strongly affected the ability of CGT to spawn and reproduce, as evidenced by their numbers. However, the deposition of fine sediments in the interstitial spaces between larger substrate likely has had an impact upon the diversity of aquatic invertebrates, particularly their seasonal availability as food, further reducing the potential for growth and survival of CGT.

Much like the GT-LK, active grazing by livestock has occurred in CGT habitat for over 100 years. Grazing allotments were first stocked with over 200,000 sheep in the late 1800's and gradually replaced by cattle at the turn of the century (Sarr 1995). Currently, the Kern Plateau is grazed by approximately 1,100-1,700 cattle annually (Trout Unlimited 2000).

Status of the Species

Modoc Sucker

On June 11, 1985, the Modoc sucker was federally listed as endangered with critical habitat (50 FR 24526). No recovery plan was produced at the time of listing, as it was determined to be unnecessary given the existence of the "Action Plan for Recovery of the Modoc Sucker," signed in 1984 by CDFG, USFS and the Service (Service 1984b).

Critical habitat was designated to include most streams (and the land for 50 feet on each side) in essentially the entire Turner Creek drainage (about 15 stream miles) and much of the Rush Creek drainage, including Johnson Creek above Highway 299 (about 11 stream miles). About 50 percent of critical habitat is managed by USFS (Modoc National Forest, Devil's Garden and Big Valley Ranger Districts), and most of the remainder is under private ownership. Known constituent elements included intermittent and permanent-water creeks, and surrounding land areas that provide vegetation for cover and protection from erosion.

The Modoc sucker is a relatively small catostomid found in the upper Pit River System of northeastern California, including the Ash and Turner Creek drainages. The species apparently reaches a maximum size near 28 cm Standard Length (SL) and matures as small as 73 to 83 mm SL (Boccone and Mills 1979, Martin 1972, Moyle and Marchiochi 1975, Rutter 1908). It was originally described by Cloudsley Rutter, based on three specimens collected from Rush Creek in 1898 (Rutter 1908). Non-breeding coloration is similar to Pit River Sacramento suckers of similar size: the back varies from greenish brown through bluish to deep grey and olive; the sides are lighter with light yellowish below; the caudal and paired fins are light yellow-orangish; and the belly is cream to white (Martin 1972). Breeding coloration in the Modoc sucker is particularly marked in males, which develop a generally reddish-orange body coloration, a strong reddish-orange lateral stripe and similar coloration on the central caudal fin rays and paired fins, as well as exhibiting extensive tuberculation on various parts of the body and fins (Boccone and Mills 1979, Martin 1972). Females occasionally exhibit a weak, dull lateral stripe and very reduced tuberculation on the fins (Boccone and Mills 1979, Martin 1972). Rutter differentiated the Modoc sucker from the sympatric Sacramento sucker by its smaller eye, small conical head, smaller scales and a nearly closed frontoparietal fontanelle (Rutter 1908). Martin further characterized the morphometric and meristic characters based on his eleven specimens and elucidated osteological differences in the jaw bones of the two species (Martin 1972).

Subsequent authors have differentiated the two species primarily by lateral line scale and dorsal fin ray counts, or by locality (Martin 1967, 1972; Moyle 1976a, Ford 1977, Cooper et al.1978). Although some authors have used intermediate lateral line counts and dorsal ray numbers to characterize "hybrids" between the two species (Cooper et al.1978, Mills 1980, Cooper 1983), a recent meristic analysis of a more extensive data set with additional characters (J. Kettratad, Humboldt State Univ., unpub. data), suggests that the presumed hybrid characteristics are within the natural range for the Modoc sucker. Nevertheless, the similarity in coloration and external morphology between Modoc and Sacramento suckers have made it difficult to field identify specimens visually without the excessive handling necessary for meristic counts.

Modoc suckers are recorded from two subdrainages of the upper Pit River, Turner Creek, and Ash Creek (Martin 1972, Moyle 1974, Ford 1977, Boccone and Mills 1979, Mills 1980). In the Turner Creek drainage, they have been collected from all permanent tributaries, including Turner, Washington, Hulbert and Garden Gulch. They were also introduced to Coffee Mill Gulch, a tributary to Washington Creek, and have maintained a self-sustaining population there. In the Ash Creek drainage, they have been collected in upper Ash Creek (in Ash Valley), upper Willow Creek, Dutch Flat Creek, Rush Creek (the type locality), and Johnson Creek, a tributary to Rush Creek.

The known range of Modoc sucker includes elevations of 4260 feet to 5040 feet. However, most known populations are constrained by the effective upstream limit of the permanent stream. Only Rush Creek extends substantially above the habitat occupied by Modoc sucker. In the upper reaches, gradient and shading increase, while temperature and available low-energy, sedimented habitat decrease. Trout dominate the upper reaches of the creek. The low-elevation ecological constraints on distribution are not fully understood.

Modoc suckers typically occupy low-energy pool habitat with abundant cover in the intermediate and upper reaches of small tributaries; they are generally absent from the cool, swift, high-gradient upper stream reaches occupied by trout (Martin 1967, Moyle and Marciochi 1975, Moyle 1976b, Ford 1977, Moyle and Daniels 1982). The pool habitat occupied by Modoc suckers generally includes soft bottoms, substantial detritus, and abundant cover. Cover can be provided by overhanging banks, larger rocks, woody debris, aquatic rooted vegetation, or filamentous algae. Moyle and Daniels (1982) report that the streams inhabited by Modoc suckers (Turner and Rush creek drainages) were all 2nd to 4th degree streams with moderate gradients (5 to 15m drop per km), low summer flows (25 to 125 liters per second), and cool summer temperatures (15 to 22°C). Modoc suckers concentrate in areas containing large pools and avoid extensive riffles, especially channelized areas.

Modoc suckers apparently mature in their second year and as small as 73 and 83 mm SL for males and females, respectively, and spawn in the spring from early April through early June, with localized spawning activity restricted to 3 to 4 weeks (Martin 1967, Moyle and Marciochi 1975, Boccone and Mills 1979). Spawning occurs in the lower end of pools or other environments with gravel substrates and moderate flow, such as behind rocks in low gradient stream reaches (Boccone and Mills 1979; P. Chappell, CDFG, pers. com. 2000). The only information available on fecundity in Modoc suckers is derived from two females (162 to 165 mm SL) collected by Moyle and Marciochi (1975) which contained 6395 to 12,590 eggs. The authors considered this to be high, given the small size of the specimens.

Modoc suckers appear to be opportunistic feeders, similar to other catostomids, feeding primarily on algae and detritus (Moyle 1976a), as well as diatoms, chironomid larvae, crustaceans (mostly amphipods and chydorid cladocerans), and aquatic insect larvae (Moyle and Marciochi 1975, Li and Moyle 1976).

There have been to date no quantitative range-wide population surveys of the Modoc sucker. Available estimates of 2600 to 5000 individuals have been based on limited sampling and visual surveys, with general qualitative estimates of unsurveyed stream reaches or populations (Moyle 1974, Ford 1977, White 1989, Scoppetone et al 1992). At the time of listing, the population estimate for Modoc suckers was considered to be somewhere under 5000 individuals, of which only about 1300 were thought to be "pure," with the remainder considered to be introgressed hybrids with Sacramento suckers (50 **FR** 24526). At this time, there is no substantial evidence supporting the hypothesis of introgressive hybridization, and all known Modoc sucker populations should be treated as viable. Quantitative surveys are planned and funded for Summer 2001, by Service and CDFG personnel (S. Reid, Service pers. comm. 2001).

The two primary threats to the Modoc sucker at the time of listing were considered to be degradation of habitat due to grazing, timber, and water management activities, and introgressive hybridization with Sacramento suckers (50 **FR** 24526). Additional threats included predation by brown trout and the lack of regulatory protection.

Land management activities including grazing, timber, and water management activities had substantially degraded the available habitat of known Modoc sucker populations. Erosion of stream banks (caused by overgrazing, channelization, timber harvesting and other activities) had resulted in the loss of riparian protection and the severe downcutting and channelization of stream channels. Siltation had further degraded suitable spawning habitat. Changes in the hydrology of the Modoc sucker streams caused by alteration of vegetation and downcutting had resulted in a contraction of the active summer flow periods and a reduction in the suitability of pool refuges in these small, often intermittent, streams.

At the time of listing, introgressive hybridization with Sacramento suckers was also considered to be a major threat to the long term viability of Modoc sucker populations, and was considered to have effectively eliminated populations in Ash, Willow, Dutch Flat, lower Rush and lower Turner Creeks. As stated earlier in this account, some authors attempted to confirm the occurrence of introgressive hybridization in Modoc sucker populations by examining scale counts of suckers collected from the known range of the Modoc sucker (Cooper et al.1978, Mills

1980, Cooper 1983). However, subsequent and ongoing meristic analyses suggest that the differentiating characters are actually within the natural meristic range for the Modoc sucker (J. Kettratad, Humboldt State University, unpubl. data). The Service has also initiated an extensive genetic analysis of Pit River sucker populations, intended to assess the reality of hybridization. Researchers at the University of California Davis, Arizona State University, and Oregon State University are investigating allozymes, mitochondrial, and nuclear DNA to determine the genetic variability, relationships, and possibility of hybridization in the Modoc and Sacramento sucker. At this time, preliminary results from both the morphological and genetic studies do not support the hypothesis of introgressive hybridization between the two species representing an active threat to the Modoc sucker.

Predation by brown trout was considered to represent a minor threat to Modoc suckers. While brown trout do still occur at low abundances in Modoc sucker streams, they are no longer stocked by CDFG.

Actions that might adversely modify critical habitat for the Modoc sucker were considered at the time of listing and remain valid today (50 **FR** 24526). They include the following activities:

1. Overgrazing by livestock in areas adjacent to streams which causes compacting and denuding of soils, leading to erosion and stream incision (this is presently occurring and poses a serious threat);
2. Channelization, impoundment, and water diversion activities along streams which would reduce available habitat allowing Sacramento suckers access to headwater areas;
3. Introduction of additional exotic species which would compete with or prey on Modoc suckers;
4. Application of herbicides or insecticides toxic to Modoc suckers or their food sources along stream courses;
5. Pollution of streams by silt or other pollutants which would reduce the suitability of the stream environment for Modoc suckers; and
6. Removal of trees or bushes along streams which would reduce cover and shade, thereby reducing the suitability of the stream environment for the species.

Although the downstream distribution of Modoc suckers is not certain at this time, they should be considered to occupy all available habitat in those streams where they occur, including upper Ash and Willow Creeks. All activities in the watersheds of Ash (including Dutch Flat), Willow, Turner (including Washington, Hulbert, Coffee Mill and Garden Gulch) and Rush (including Johnson) Creeks should be considered to potentially adversely affect Modoc suckers.

Environmental Baseline

Modoc sucker and its Critical Habitat

Modoc suckers currently occupy two subdrainages of the upper Pit River, Turner Creek and Ash Creek (Martin 1972, Moyle 1974, Ford 1977, Boccone and Mills 1979, Mills 1980). In the Turner Creek drainage, they have been recently collected from all permanent tributaries, including: Turner, Washington, Hulbert and Garden Gulch (a new locality discovered in 2000);

they were also introduced to Coffee Mill Gulch, a tributary to Washington Creek, and have maintained a self-sustaining population there. In the Ash Creek drainage, they have been collected in upper Ash Creek (in Ash Valley), upper Willow Creek, Dutch Flat Creek, Rush Creek (the type locality), and Johnson Creek, a tributary to Rush Creek; most of these streams have been sampled recently, and genetic samples from Ash and Willow Creeks are being analyzed for identification and determination of possible hybridization. Most known populations are constrained by the effective upstream limit of the permanent stream. The downstream range of Modoc suckers, below the lower Hwy 139 bridge, is not currently known, as these reaches are on private land and have not been surveyed recently. The low-elevation ecological constraints on Modoc sucker distribution are not fully understood.

In the past, land management activities including grazing, timber, and water management activities had substantially degraded the available habitat of known Modoc sucker populations. Since the early 1980s, the USFS has been managing and restoring Modoc sucker streams for riparian health and aquatic habitat improvement. In the Turner Creek drainage, most of the USFS lands bordering streams have either been excluded from grazing or strictly managed for riparian condition. Restoration projects have included check dams and deflectors to control headcutting, reinforcement and revegetation of banks, planting of willows, placement of boulder structures, and excavation of pools. In the Ash Creek drainage, most of Johnson and Dutch Flat Creeks on USFS lands have been excluded from grazing, and the Higgins Flat area was part of a restoration project in 1989 and 1990. In 1990, the California Wildlife Conservation Board purchased 160 acres of private land on the occupied section of Dutch Flat Creek and manages it for the benefit of the Modoc sucker.

Recent observations of historically occupied habitat in the Ash and Turner Creek systems show extensive improvement of habitat conditions on USFS lands, while those reaches of stream on private lands on Ash Creek, Willow Creek, Turner Creek and Rush Creek appear to be stabilized and improving as well. CDFG has received funding for an extensive field survey and assessment of habitat conditions within the known range of the Modoc sucker to be carried out in the 2001 field season, with cooperation from the Service and USFS.

Land management on private lands is relatively stable. Activities on private lands containing occupied Modoc sucker streams include livestock grazing, hay cropping, and trout fishing. Recent surveys by the Service and CDFG on many of these lands have shown that they support substantial populations of suckers. There is no indication that private land management will change in the foreseeable future.

There have been to date no quantitative range-wide population surveys of the Modoc sucker. Available estimates of 2600 to 5000 individuals have been based on limited sampling and visual surveys, with general qualitative estimates of unsurveyed stream reaches or populations (Moyle 1974, Ford 1977, White 1989, Scoppetone et al 1992). Much of the variation in total population estimates resulted from surveys being conducted in disparate areas, and from the exclusion of populations based on the assumption that they were not "pure," due to introgressive hybridization with Sacramento suckers, though the Service does not currently recognize hybrids. Field observations in 1999 and 2000 (Service) suggest that populations have not declined and are still present in all historical habitat surveyed, including at least one additional population. Surveys to be carried out in the 2001 field season, in cooperation between the Service, CDFG, and USFS should provide more accurate estimates of population sizes.

The original "Action Plan for Recovery of the Modoc Sucker," signed in 1984 (Service 1984b) proposed 28 recovery actions. Most are either completed, ongoing, or are no longer appropriate (pending final assessment of the hybridization threat). The primary remaining recovery task is the expansion of the Modoc sucker's range beyond the Turner and Rush Creek drainages. To this end, the Service and CDFG are conducting field surveys in appropriate habitat throughout the upper Pit drainage and are evaluating the status of historical populations in Willow and Ash Creeks.

Status of the Species

Lost River and Shortnose Suckers

The Lost River sucker (LRS) (*Deltistes luxatus*) and shortnose sucker (SNS) *(Chasmistes brevirostris*) were federally listed as endangered on July 18, 1988, because they were at risk of extinction due to significant population declines with continued downward trends, a lack of recent recruitment, range reduction, habitat loss/degradation and fragmentation, potential hybridization, competition and predation by exotic fishes, and other factors (53 **FR** 27130). Both species had been placed on the California rare species list in 1972.

These fish were once very abundant and were important seasonal foods of native Americans and settlers in the upper Klamath River basin (Cope 1879, Gilbert 1898, Howe 1968). Spawning migrations occurred in the spring at a critical time when winter food stores had been exhausted. The Klamath and Modoc Indians dried suckers for later use. It was estimated that the aboriginal harvest at one site on the Lost River may have been 50 tons annually (Stern 1966).

Hybridization was believed to be widely occurring in Klamath basin suckers and was considered a threat by the Service at time of listing (USFWS 1988). It was suspected that hybridization was indicative of a limitation of spawning habitat and resultant cross-fertilization of eggs (Williams et al 1985).

SNS and LRS were undoubtedly present in Lake Modoc, the Pleistocene lake that inundated all of the upper Klamath Basin from Wood River to Tule Lake that was below 4240 feet (Dicken 1980). The lake outlet near Keno was at a higher elevation, thus blocking flow below 4240 feet. elevation. Lake Modoc had several interconnecting arms and was approximately 1,000 square miles in area and 75 miles in length. The lake began to dry at the end of the Pleistocene about

10,000 to 12,000 years ago. UKL, Agency Lake, Tule Lake, Swan Lake, and Lower Klamath Lake are the major remaining parts of Lake Modoc.

Historically, SNS and LRS were abundant and widespread in UKL and its lower tributaries, probably including the Lost River system, Clear Lake, Tule Lake and Lower Klamath Lake (Cope 1879, Gilbert 1898, USFWS 1993). The Klamath largescale sucker was also widespread in the Upper Klamath Basin, and probably occurred in the Lost River system as well (Andreasen 1975, Buettner and Scoppettone 1990). LRS historically occurred in the UKL its tributaries, including the Williamson, Sprague, and Wood rivers; Crooked, Crystal, Sevenmile, and Odessa creeks, and Fourmile Creek and Slough (Stine 1982); the Lost River system, including Tule Lake, Lower Klamath Lake, and Sheepy Lake (Andreasen 1975, Moyle 1976, Williams et al. 1985). The distribution of the SNS is less well understood because of its similarity to the Klamath largescale sucker, especially juveniles. SNS historically occurred in UKL and its tributaries (Andreasen 1975, Miller and Smith 1981, Williams et al. 1985); although Moyle (1976) also includes Lake of the Woods and the Lost River system as part of the species historic distribution (Sonnevil 1972, Buettner and Scoppettone 1991, Scoppettone and Vinyard 1991, Scoppettone and Buettner 1995, Perkins and Scoppettone 1996). Andreasen (1975) believed that the Lake of the Woods sucker was a distinct species, *Chasmistes stomias,* which became extinct in 1952 as a result of fish control operations.

Adult suckers are mainly found at deeper depths. Radio-telemetry studies show that adult LRS and SNS primarily use water depths of 6-9 feet and strongly avoid depths of less than 4 feet. There are observations of suckers spawning in shallower depths during the night when cover is provided by darkness. Suckers apparently avoid clear water except when showing ill effects of poor water quality (M. Buettner, USBR, per. com.). These observations suggest that suckers are strongly associated with cover, primarily depth and turbidity. LRS should be considered an obligate lacustrine fish, as no known population exists in rivers. SNS, on the other hand is present, throughout its life cycle in some riverine habitats (e.g., Lost River, Miller Creek, Willow Creek, and other tributaries of Clear lake and Gerber Reservoir) and should be considered a lacustrine/riverine facultative species. Perkins and Scoppettone (1996) found adult SNS in Willow Creek (Clear Lake Basin) resting in the bottom of pools and used undercut banks, overhanging shrubs, and algae as cover.

Juvenile sucker (suckers of 2.5-10 cm total length) habitat is generally in nearshore areas less than 1.3 m in depth. It is unclear what habitat and substrate types are preferred. Markle and Simon (1993) and Simon et al. (2000) found age 0 juveniles in water generally less than 50 cm deep, on rocky substrates including rock, gravel, and gravel and sand mix. Juveniles avoided pure sand and softer mud or organic substrates. Vincent (1968) found that juvenile suckers were only abundant on rocky substrates. The use of vegetated habitats by juveniles is not well understood due to difficulty in sampling (L. Dunsmore, Klamath Tribes, per. com. 1999). Juvenile sucker monitoring by Oregon State University focused on mostly unvegetated locations because of sampling difficulties associated with vegetated areas. However, the Klamath Tribes have observed age 0 juvenile suckers in emergent vegetation along the lower Williamson River and Goose Bay (L. Dunsmoor, Klamath Tribes, per. com.). USGS conducted trap net surveys near Goose Bay in emergent vegetation and adjacent unvegetated areas during summer 2000. Catch rates were generally higher in the vegetated versus unvegetated sites (R. Shively, USGS per. com.). No information is available on distribution of juvenile suckers in extensive stands of emergent vegetation at Hanks Marsh and Upper Klamath Marsh. However, OSU captured very few juvenile suckers adjacent to shoreline marsh habitats of the northern margin of UKL, and along the marsh at Squaw Point, Shoalwater Bay, and Hanks Marsh (Simon et al. 2000). LRS juveniles did not appear in UKL summer beach seine samples where SNS were collected, but were later present in fall cast net samples (Markle and Simon 1994). Markle and Simon (1994) did some juvenile sucker sampling in Gerber Reservoir. Large numbers were collected in June, suggesting spawning occurs earlier there than in UKL. Markle and Simon (1994) suggested that owing to better transparency of Gerber Reservoir water, juvenile suckers may move into deeper water before those in UKL. Tributary-resident juveniles, mostly SNS, generally are associated with pools having gravel and cobble bottoms (Buettner and Scoppettone 1990). Reid and Larson (unpub. data) observed age 0 SNS (those in their first year) inhabiting sandy pools where they schooled with dace in Willow Creek, a Clear Lake tributary.

arval habitat in UKL is generally nearshore in water less than 50 cm deep and often associated with aquatic vegetation or some form of structure such as logs or large rocks (Buettner and Scoppettone 1990, Markle and Simon 1994, Klamath Tribes 1995, 1996, Cooperman and Markle 2000). Larvae may be present in schools, especially during the day. In UKL, larvae appear to be concentrated near the mouth of the Williamson River, in Goose Bay, and may also be common in the lower Wood River. These sites are near known spawning areas. Dunsmoor found larval densities as high as 16 larvae/square meter in Goose Bay emergent vegetation (Klamath Tribes 1995). In 1998, OSU documented that sucker larvae in pop net samples were much more abundant in emergent and submergent macrophytes than in woody vegetation such as willows, and unvegetated areas (Cooperman and Markle 2000). Woody vegetation and unvegetated sites had similar densities. Also there was no significant difference in numbers of suckers caught in *Sparganium* (burreed) and *Scirpus* (bulrush) vegetation types. Some information of larval sucker habitat was obtained from several of the upper Klamath River reservoirs by Desjardins and Markle (2000). They found that at Copco Reservoir, larvae were found predominately at non-vegetated sites, even though vegetated sites made up most of the sampling sites. Larval sucker ecology in Clear Lake is unstudied. It is known that emergent vegetation is nearly nonexistent at the present time. Cover is likely provided by high turbidity and larvae may utilize shallow areas where larger fish predators may be scarce.

For additional discussions of sucker biology, including: age and growth, hybridization and genetics, reproduction, population status, condition, sucker die-offs, entrainment, refugial habitat use, larval habitat, juvenile ecology, juvenile habitat, and adult habitat, refer to the LRS and SNS Recovery Plan (USDI/FWS 1993), the LRS and SNS Proposed Critical Habitat Biological Support Document (USDI/FWS 1994), and the BA on the U.S. Bureau of Reclamation's

(USBR) Klamath Project and associated Pacificorp and New Earth Company Operations (USBR 1996). These data are incorporated into this biological opinion by reference.

LRS and SNS feed primarily on zooplankton and aquatic insect larvae (Buettner and Scoppettone 1990; Scoppettone et al.1995, and Parker et al. 2000). LRS eat benthic chironomids, which are larval midges, while SNS feeds mostly on planktonic zooplankton, namely the cladocerans, *Daphnia* and *Chydorus* spp. Both suckers consume detritus and have long guts characteristic of detritivores (Parker et al. 2000). LRS and SNS appear to feed on the larger size classes of available prey (Parker et al. 2000). It is suspected that larval suckers subsist mainly on zooplankton, and that larval survival is likely influenced by the degree of coincidence between zooplankton bloom formation and larval entry into nursery areas (Klamath Tribes 1996).

Environmental Baseline

Lost River and shortnose suckers

The Lost River sub-basin, about 2,000 sq. mi. in size, contains major sucker populations in Clear Lake and Gerber reservoirs. Smaller numbers of suckers occur in the Lost River, Miller Creek, and Tule Lake sumps. Most of these are SNS; however, a significant population of LRS is present in Clear Lake. Only those populations in Clear Lake and the upper Lost River are included in the action area.

Aquatic habitats throughout the upper Klamath Basin are highly modified, but the Lost River has perhaps been the most severely affected. As mentioned above, the Lost River was once a major spawning site for suckers. Modoc and Klamath Indians gathered along the Lost River during the spring spawning runs to harvest suckers. Later it was the site for several canneries. However, today the Lost River supports few suckers, and furthermore, can perhaps be best characterized as an irrigation water conveyance, rather than a river. For nearly its entire 75 mile length, from Clear Lake Reservoir to Tule Lake Sump, the Lost River is highly modified to meet agricultural demands. Flows are completely regulated, it has been channelized in one 6 mi reach, its riparian habitats and adjacent wetlands are highly modified, and it receives significant discharges from agricultural drains and sewage effluent. Likely the active floodplain is no longer functioning except in very high water conditions. This has likely affected wetlands and wet meadows and may have resulted in lowered water tables, increasing the need for irrigation.

The Lost River currently supports very small numbers of LRS and SNS, with SNS predominating. Suckers, almost exclusively SNS, have been reported from just below the Clear Lake Dam; lower Antelope Creek; Malone Reservoir; Big Spring to Harpold Reservoir; and below Anderson Rose Dam (Koch and Contreas 1973, Buettner and Scoppettone 1991). Reclamation has collected a few LRS and SNS each year during salvage operations immediately below Clear Lake Dam. These fish were released in the Lost River at Stevenson Park near Olene. Few suckers are believed to occupy the 8 mile reach between Clear Lake Dam and

Malone Dam owing to the high gradient and lack of pool habitat. Additionally flows in this reach are highly variable being high in summer during irrigation releases and being low the remainder of the year when halted at the end of irrigation season. Malone Reservoir is not believed to support a viable sucker population, but instead probably contains waifs entrained into the Lost River from Clear Lake (Buettner and Scoppettone 1991). In 1992, 350 SNS and 4 LRS were salvaged at Clear Lake and placed in Malone Reservoir by Reclamation staff.

Environmental Baseline

Proposed Lost River and shortnose sucker Critical Habitat

Six critical habitat units (CHUs) have been proposed for LRS and SNS because they contain the physical and biological features essential to the conservation and recovery (USFWS 1994). These "primary constituent elements," include: 1) water of sufficient quantity and quality to provide conditions required for the particular life stage of the species; 2) physical habitat inhabited or potentially habitable by the suckers for use as refuges, spawning, nursery, feeding, or rearing areas, or as migration corridors; and 3) food supply and a natural scheme of predation, parasitism, and competition in the biological environment. For a more detailed discussion of the primary constituent elements, refer to the Lost River and Shortnose Sucker Critical Habitat Draft Biological Support Document (USFWS 1994).

Critical Habitat Unit 1 comprises the Clear Lake watershed and includes waters of Clear Lake below the high water line, Willow Creek (including North Fork, East Fork, Wildhorse and Fourmile Creeks) and Boles Creek watersheds, which are tributaries to Clear Lake. Most of this unit is managed by the Modoc National Forest and the Service as Clear lake National Wildlife Refuge. Grazing is the primary land use. Section 7 consultations on the effects of grazing management on suckers and bald eagles have been completed for the two Federal agencies (USFWS, 1995, 2000). The condition of the watershed is good because of the management focus of the two agencies to protect water quality and aquatic habitat. This is the only proposed critical habitat unit that is expected to be affected by the proposed action.

Status of the Species

Warner Sucker

The Warner sucker (*Catostomus warnerensis*) was listed by the U. S. Fish and Wildlife Service (Service) as threatened in 1985 (U. S. Fish and Wildlife Service 1985). Critical habitat was designated for the Warner sucker on September 27, 1985 (U.S. Fish and Wildlife Service 1985) and includes the following areas: Twelvemile Creek from confluence of Twelvemile and Twentymile Creeks upstream for about 6 stream kilometers (4 stream miles); Twentymile Creek starting about 14 kilometers (9 miles) upstream of the junction of Twelvemile and Twentymile Creeks and extending downstream for about 14 kilometers (9 miles); Spillway Canal north of Hart Lake and continuing about 3 kilometers (2 miles) downstream; Snyder Creek, from the confluence of Snyder and Honey Creeks upstream for about 5 km (3 miles); Honey Creek from the confluence of Hart Lake upstream for about 25 kilometers (16 miles) and 16 meters (50 feet) on either side of these waterways.

The probable historic range of the Warner sucker includes the main Warner Lakes (Pelican, Crump, and Hart), and other accessible standing or flowing water in the Warner Valley, as well as the low to moderate gradient reaches of the tributaries which drain into the Valley. The tributaries include Deep Creek, up to the falls west of Adel, the Honey Creek drainage, and the Twentymile Creek drainage. In Twelvemile Creek, a tributary to Twentymile Creek, the historic range of the sucker extended through Nevada and back into Oregon, but probably not as high as the California reach of the stream.

Warner suckers are generally potadromous in that they spawn in streams and rear in lake environments. However, they have also evolved a stream resident component and have the capacity to spawn in lakes. This dual spawning strategy protects the species from drought and flood events.

The Warner Basin provides two generally continuous aquatic habitat types; a temporally more stable stream environment and a temporally less stable lake environment (e.g., lakes dried in 1992). Representatives of a species occupying this continuum form a metapopulation. Observations indicate that Warner suckers and Warner Valley redband trout grow larger in the lakes than they do in streams (White et al. 1990). The smaller stream morph and the larger lake morph are examples of phenotypic plasticity within metapopulations of the Warner sucker and the Warner Valley redband trout. Expressions of these two morphs in both the Warner sucker and the Warner Valley redband trout might be as simple as each species being opportunistic. When lake habitat is available, the stream morph migrates downstream and grows to become a lake morph. These lake morphs can migrate upstream to spawn or become resident populations while the lake habitat is available. Presumably, when the lake habitat dries up the lake morph is lost but the stream morph persists. When the lakes refill, the stream morph can reinvade the lakes to again become lake morphs. The lake habitat represents a less stable but more productive environment that the metapopulations of Warner suckers and Warner Valley redband trout use on an opportunistic basis. The exact nature of the relationship between lake and stream morphs remains poorly understood and not well studied.

The feeding habits of the Warner sucker depend to a large degree on habitat and life history stage, with adult suckers becoming more generalized than juveniles and YOY. Larvae have terminal mouths and short digestive tracts, enabling them to feed selectively in midwater or on the surface. Invertebrates, particularly planktonic (having weak powers of locomotion) crustaceans, make up most of their diet. As the suckers grow, they develop subterminal mouths, longer digestive tracts, and gradually become generalized benthic (living on the bottom) feeders on diatoms (small, usually microscopic, plants), filamentous (having a fine string-like appearance) algae, and detritus (decomposed plant and animal remains). Adult stream morph suckers forage nocturnally over a wide variety of substrates such as boulders, gravel, and silt. Adult lake morph suckers are thought to have a similar diet, though caught over predominantly muddy substrates (Tait and Mulkey 1993a,b).

Spawning usually occurs in April and May in streams, although variations in water temperature and stream flows may result in either earlier or later spawning. Temperature and flow cues appear to trigger spawning, with most spawning taking place at 14-20 degrees Celsius (57-68 degrees Fahrenheit) when stream flows are relatively high. Suckers spawn in sand or gravel beds in slow pools (White et al. 1990, 1991, Kennedy and North 1993). Allen et al. (1996) surmise that spawning aggregations in Hart Lake are triggered more by rising stream temperatures than by peak discharge events in Honey Creek.

In years when access to stream spawning areas is limited by low flow or by physical in-stream blockages (such as beaver dams or diversion structures), suckers may attempt to spawn on gravel beds along the lake shorelines. In 1990, suckers were observed digging nests in 40+ centimeters (16+ inches) of water on the east shore of Hart Lake at a time when access to Honey Creek was blocked by extremely low flows (White et al. 1990).

Larvae are found in shallow backwater pools or on stream margins where there is no current, often among or near macrophytes. YOY are often found over deep, still water from midwater to the surface, but also move into faster flowing areas near the heads of pools (Coombs et al. 1979). Larvae venture near higher flows during the daytime to feed on planktonic organisms but avoid the mid-channel water current at night. This aversion to downstream drift may indicate that spawning habitat is also used as rearing grounds during the first few months of life (Kennedy and North 1993).

Juvenile suckers (1 to 2 years old) are usually found at the bottom of deep pools or in other habitats that are relatively cool and permanent such as near springs. As with adults, juveniles prefer areas of the streams which are protected from the main flow (Coombs et al. 1979). Larval and juvenile mortality over a 2-month period during the summer has been estimated at 98 percent and 89 percent, respectively, although accurate larval fish counts were hampered by dense macrophyte cover (Tait and Mulkey 1993b).

White et al. (1991) found in qualitative surveys that, in general, adult suckers used stretches of stream where the gradient was sufficiently low to allow the formation of long (50 meters (166.6 feet) or longer) pools. These pools tended to have: undercut banks; large beds of aquatic macrophytes (usually greater than 70 percent of substrate covered); root wads or boulders; a surface to bottom temperature differential of at least 2 degrees Celsius (at low flows); a maximum depth greater than 1.5 meters (5 feet); and overhanging vegetation (often *Salix* spp.). About 45 percent of these pools were beaver ponds, although there were many beaver ponds in which suckers were not observed. Suckers were also found in smaller or shallower pools or pools without some of the above mentioned features. However, they were only found in such places when a larger pool was within approximately 0.4 kilometer (0.25 mile) upstream or downstream of the site.

Submersed and floating vascular macrophytes are often a major component of sucker-inhabited pools, providing cover and harboring planktonic crustaceans which make up most of the YOY sucker diet. Rock substrates such as large gravel and boulders are important in providing surfaces for epilithic (living on the surface of stones, rocks, or pebbles) organisms upon which adult stream resident suckers feed, and finer gravels or sand are used for spawning. Siltation of sucker stream habitat increases the area of soft stream bed necessary for macrophyte growth, but embeds the rock substrates utilized by adult suckers for foraging and spawning. Embeddedness, or the degree to which hard substrates are covered with silt, has been negatively correlated with total sucker density (Tait and Mulkey 1993).

Habitat use by lake resident suckers appears to be similar to that of stream resident suckers in that adult suckers are generally found in the deepest available water where food is plentiful. Not surprisingly, this describes much of the habitat available in Hart, Crump, and Pelican Lakes, as well as the ephemeral lakes north of Hart Lake. Most of these lakes are shallow and of uniform depth (the deepest is Hart Lake at 3.4 meters (11.3 feet) maximum depth), and all have mud bottoms that provide the suckers with abundant food in the form of invertebrates, algae, and organic matter.

Environmental Baseline

Warner sucker

Habitat fragmentation and degradation, due to agricultural development in the last century and the placement of irrigation structures in spawning streams during the last sixty years, are in part, responsible for the decline in abundance and distribution of Warner suckers (Williams et al. 1990). In addition, the introduction of non-native piscivorous fishes such as black and white crappie, brown bullhead and largemouth bass in the 1970's is believed to have inhibited successful recruitment to lake populations (Williams et al. 1990). Stream resident populations have been negatively impacted from effects associated with livestock grazing, water diversions and roads.

Between 1977 and 1991, eight studies examined the range and distribution of the Warner sucker throughout the Warner Valley (Kobetich 1977, Swenson 1978, Coombs et al. 1979, Coombs and Bond 1980, Hayes 1980, White et al. 1990, Williams et al. 1990, White et al. 1991). These surveys have shown that when adequate water is present, Warner suckers may inhabit all the lakes, sloughs, and potholes in the Warner Valley. The documented range of the sucker extended as far north into the ephemeral lakes as Flagstaff Lake during high water in the early 1980's, and again in the 1990's (Allen et al. 1996). Stream resident populations are found in Honey Creek, Snyder Creek, Twentymile Creek and Twelvemile Creek. Intermittent streams in the drainages may support small numbers of migratory suckers in high water years.

Although stream resident Warner suckers are present on BLM lands, they do not currently, nor did they historically, inhabit streams on Forest Service lands within the Warner Basin. Upper distribution limits are typically determined by stream gradient and stream volume. Habitat conditions on Forest Service lands upstream from occupied habitat are generally in poor condition from past and on-going effects from roads associated with timber harvest, and from grazing activities. Erosion of stream banks and loss riparian vegetation (effects of overgrazing, timber harvest and other activities) has increased water temperatures and peak flows, silted spawning beds and reduced the quality and quantity of pool habitat.

The Service has consulted on Forest Land and Resource Management Plans as well as Programmatic and single action consultations to reduce the effects of Forest activities that continue to suppress the degraded baseline of watersheds with the Warner Basin. The USFS, along with the BLM, has been managing and restoring streams and uplands within the Warner Basin since the mid-1980's. Road decommissioning, culvert replacements, changes in grazing management, timber harvest strategies, and instream restoration projects are all contributing to reversing the decline in watershed health that began over a century before.

Recovery objectives and criteria are outlined in the Recovery Plan for the Threatened and Rare Native Fishes of the Warner Basin and Alkali Subbasin (USFWS 1998). Among the objectives is objective #1131 which states: Maintain high quality habitats on Federal lands to prevent species declines. Federal agencies should develop goals to maintain high quality habitats. Where current agency land management is deemed inadequate to protect (i.e., maintain or improve upon current conditions) high quality habitat conditions, recommend modifications to agencies to bring about needed changes in land use. Set management recommendations conservatively until such time as watershed analyses are completed, or other long term plans can be developed.

Few of the objectives in the recovery plan have been met, in particular those that involve modification (screening and passage) to water delivery systems on private lands in the Warner Valley. USFWS, BLM, USFS and ODFW are initiating research and monitoring to prioritize activities with private land owners to facilitate passage and screening projects. In addition, research planned for 2001 will replicate studies conducted in the early 1990's and will allow for a current assessment of the status of Warner suckers both in lake habitat and in streams within the Warner Basin.

Status of the Species

*California red-legged frog*The red-legged frog was federally listed as threatened on May 23, 1996, (61 **FR** 25813) effective June 24, 1996. Critical habitat was proposed on September 11, 2000 (65 **FR** 54892). This species is the largest native frog in the western United States (Wright and Wright 1949), ranging from 4 to 13 centimeters (1.5 to 5.1 inches) in length (Stebbins 1985). The abdomen and hind legs of adults are largely red; the back is characterized by small black flecks and larger irregular dark blotches with indistinct outlines on a brown, gray, olive, or reddish background color. Dorsal spots usually have light centers (Stebbins 1985), and dorsolateral folds are prominent on the back. Larvae (tadpoles) range from 14 to 80 millimeters

(0.6 to 3.1 inches) in length, and the background color of the body is dark brown and yellow with darker spots (Storer 1925).
Red-legged frogs have paired vocal sacs and vocalize in air (Hayes and Krempels 1986). Female frogs deposit egg masses on emergent vegetation so that the egg mass floats on the surface of the water (Hayes and Miyamoto 1984). Red-legged frogs breed from November through March with earlier breeding records occurring in southern localities (Storer 1925). Individuals occurring in coastal drainages are active year-round (Jennings *et al*. 1992), whereas those found in interior sites are normally less active during the cold season.

Red-legged frogs have been observed using a variety of habitat types, including various aquatic, riparian, and upland habitats; they may complete their entire life cycle in a particular area without using other components (*i.e*., a pond is suitable for all life stages) or utilize multiple habitat types. These variable life history characteristics enable red-legged frogs to change habitat use in response to varying conditions. During a period of abundant rainfall *e.g.*, El Nino), the entire landscape may become suitable red-legged frog habitat; conversely, habitat use may be drastically confined during periods of prolonged drought. Populations of red-legged frogs are most likely to persist where multiple breeding areas are embedded within a matrix of habitats used for dispersal, a trait typical of many anuran species (Marsh *et al.* 1999, Griffiths 1997, Sjogren-Gulve 1994, Mann *et al.* 1991, Laan and Verboom 1990, Reh and Seitz 1990). Where this habitat mosaic exists, local extinctions may be counterbalanced by the colonization of new habitat or recolonization of unoccupied areas of suitable habitat.

Breeding sites have been documented in a variety of aquatic habitats. Larvae, juveniles and adult frogs have been observed inhabiting streams, creeks, ponds, marshes, sag ponds, deep pools and backwaters within streams and creeks, dune ponds, lagoons, estuaries, and artificial impoundments, such as stock ponds and tailing ponds. Furthermore, breeding has been documented in these habitat types irrespective of vegetative cover. Frogs often successfully breed in artificial ponds with little or no emergent vegetation and have been observed to successfully breed and inhabit stream reaches that are not cloaked in riparian vegetation. Factors other than cover are more likely to influence the suitability of aquatic breeding sites, such as the general lack of introduced aquatic predators.

Red-legged frogs often disperse from their breeding habitat to utilize various aquatic, riparian, and upland habitats as summer habitat. This could include ponds, streams, marshes, boulders or rocks and organic debris such as downed trees or logs; industrial debris; and agricultural features, such as drains, watering troughs, or spring boxes. When riparian habitat is present, frogs spend considerable time resting and feeding in the vegetation (Rathbun *in litt*. 2000). Recent radiotelemetry data show that red-legged frogs are found extensively within 60 meters (196 feet) from the edge of aquatic habitat and up to 100 meters (328 feet) away from aquatic habitat (Bulger *et al. in litt*. 2000). When riparian habitat is absent, frogs spend considerable time resting and feeding under rocks and ledges both in and out of water (Tatarian, *in litt*. 2000). Red-legged frogs can also use small mammal burrows and moist leaf litter (Jennings and Hayes 1994) and;

incised stream channels with portions narrower and deeper than 18 inches may also provide habitat (61 FR 25813). This type of dispersal and habitat use, however, is not observed in all red-legged frogs and is most likely dependent on the year to year variations in climate and habitat suitability and varying requisites per life stage.

At any time of the year, adult red-legged frogs may move from breeding sites. They can be encountered living within streams at distances exceeding 2.8 km (1.8 miles) from the breeding site and have been found greater than 100 m (328 ft) from water in adjacent dense riparian vegetation for up to 77 days (Bulger *et al. in litt.* 2000, Rathbun *et al.* 1993), but are typically within 60 m (200 ft) of water. During periods of wet weather, starting with the first rains of fall, some individuals may make overland excursions through upland habitats. Most of these overland movements occur at night. Dispersing adult frogs in northern Santa Cruz County traveled distances from 0.4 km (0.25 mile) to more than 3.2 km (2 miles) without apparent regard to topography, vegetation type, or riparian corridors (J. Bulger, *in litt.* 2000). Newly metamorphosed juveniles tend to disperse locally July through September and then disperse away from the breeding habitat during warm rain events (Jennings, *in litt.* 2000, Scott, *in litt.* 2000). The distances newly metamorphosed juveniles are capable of traveling has not been studied, but is likely dependent upon rainfall and moisture levels during and immediately following dispersal events and are likely dependent on habitat availability and environmental variability. The ability of juveniles and adults to disperse is important for the long term survival and recovery of the species as the dispersing individuals can recolonize and "rescue" areas subjected to localized extinctions.

Egg masses contain about 2,000 to 5,000 moderate sized (2.0 to 2.8 millimeters [0.08 to 0.11 inches] in diameter), dark reddish brown eggs and are typically attached to vertical emergent vegetation, such as bulrushes (*Scirpus* spp.) or cattails (Jennings *et al.* 1992). Red-legged frogs are often prolific breeders, laying their eggs during or shortly after large rainfall events in late winter and early spring (Hayes and Miyamoto 1984). Eggs hatch in 6 to 14 days (Jennings 1988). Larvae undergo metamorphosis 3.5 to 7 months after hatching (Storer 1925, Wright and Wright 1949, Jennings and Hayes 1990). Of the various life stages, larvae probably experience the highest mortality rates; survival from hatching to metamorphosis has been estimated as less than 1 percent (Jennings *et al.* 1992), 1.9 percent (Cook 1997), less than 5 percent for red-legged frog tadpoles co-occurring with bullfrog tadpoles and 30-40 percent for red-legged frog tadpoles occurring without bullfrogs (Lawler *et al.* 1999). Sexual maturity normally is reached at 3 to 4 years of age (Storer 1925, Jennings and Hayes 1985). Red-legged frogs may live 8 to 10 years (Jennings *et al*. 1992). Populations of red-legged frogs fluctuate from year to year. When conditions are favorable red-legged frogs can experience extremely high rates of reproduction and thus produce large numbers of dispersing young and a concomitant increase in the number of occupied sites. In contrast, red-legged frogs may temporarily disappear from an area when conditions are stressful (*e.g.*, drought).

The diet of red-legged frogs is highly variable. Hayes and Tennant (1985) found invertebrates to be the most common food items. Vertebrates, such as Pacific tree frogs (*Hyla regilla*) and California mice (*Peromyscus californicus*), represented over half the prey mass eaten by larger frogs (Hayes and Tennant 1985). Hayes and Tennant (1985) found juvenile frogs to be active diurnally and nocturnally, whereas adult frogs were largely nocturnal. Feeding activity probably occurs along the shoreline and on the surface of the water (Hayes and Tennant 1985). Larvae likely eat algae (Jennings *et al*. 1992).

Habitat loss and alteration, over-exploitation, and introduction of exotic predators were significant factors in the species' decline in the early- to mid-1900s. Reservoir construction, expansion of introduced predators, grazing and prolonged drought fragmented and eliminated many of the Sierra Nevada foothill populations. Only three documented populations are known to remain in the Sierra Nevada, compared to more than 60 historical records. It is likely that additional, small undocumented populations currently exist within the Sierra Nevada. Several researchers have noted the decline and eventual disappearance of red-legged frog populations once bullfrogs became established at the same site (L. Hunt, *in litt*. 1993, S. Barry, *in litt*. 1992, S. Sweet, *in litt*. 1993). This has been attributed to both predation and competition. Cook (*in litt*. 2000) documented bullfrog predation of a large adult red-legged frog. This supports Twedt's (1993) suggestion that bullfrogs could prey on subadult northern red-legged frogs. In addition to predation, bullfrogs may have a competitive advantage over red-legged frogs, bullfrogs are larger, possess more generalized food habits (Bury and Whelan 1984), possess an extended breeding season (Storer 1933) where an individual female can produce as many as 20,000 eggs during a breeding season (Emlen 1977), and larvae are unpalatable to predatory fish (Kruse and Francis 1977). In addition to competition, bullfrogs also interfere with red-legged frog reproduction. Both California and northern red-legged frogs have been observed in amplexus with (mounted on) both male and female bullfrogs (Jennings and Hayes 1990, Twedt 1993, Service Files). Thus bullfrogs are able to prey upon and out-compete red-legged frogs, especially in sub-optimal habitat.

Red-legged frogs are currently threatened by human activities, many of which operate synergistically and cumulatively with each other and with natural disturbances (*i.e.*, droughts and floods). Current factors associated with declining populations of the frog include degradation and loss of its habitat through agriculture, urbanization, mining, improper management of grazing, recreation (including off-highway vehicle use), timber harvesting, non-native plants, impoundments, water diversions, degraded water quality, and introduced predators. These factors have resulted in the isolation and fragmentation of habitats within many watersheds, often precluding dispersal between sub-populations and jeopardizing the viability of metapopulations (broadly defined as multiple subpopulations that occasionally exchange individuals through dispersal, and are capable of colonizing or "rescuing" extinct habitat patches). Although red-legged frog populations are usually threatened by more than one factor. The small, isolated nature of the remaining populations in combination with the continued colonization of existing habitat by nonnative species represents the most significant current threats to red-legged frogs in the Sierra Nevada. The remaining populations within the Sierra Nevada are in immediate need of additional suitable breeding habitat to ensure that stochastic events will not result in their extirpation.

Critical Habitat: Thirty-one critical habitat units, totalling approximately 2.2 million hectares (5.4 million acres) have been proposed in 31 California counties. Within the action area, 5 units totalling approximately 336,000 hectares (830,000 acres) in Plumas, Butte, Sierra, Yuba, El Dorado, Calaveras, and Toulumne counties, including lands managed by the Plumas, Lassen, El Dorado, and Stanislaus National Forests.

The primary constituent elements of critical habitat for the red-legged frog include aquatic, upland, and dispersal habitat. Aquatic components consist of all still or slow-flowing freshwater aquatic features possessing minimum water depths of 20 cm (8 in.), with the exception of deep lacustrine water habitat inhabited by nonnative predators, that are essential for providing space, food, and cover needed to sustain eggs, tadpoles, metamorphosing juveniles, nonbreeding subadults, and breeding and nonbreeding adult frogs, and are found in areas with two or more suitable breeding locations and a permanent water source with no more than 2 km (1.25 mi) separating these locations. Dispersal habitat consists of upland and aquatic areas, free of barriers, essential for providing connectivity between aquatic areas identified above. Upland Habitat components are areas within 150 m (500 ft) from the edge of the aquatic primary constituent element.

Environmental Baseline

California red-legged frog

The draft recovery plan for red-legged frogs identifies eight Recovery Units (USFWS 2000). The establishment of these recovery units are based on the Recovery Team's determination that various regional areas of the species' range are essential to its survival and recovery. The status of the red-legged frog will be considered within the smaller scale of Recovery Units as opposed to the overall range. These Recovery Units are delineated by major watershed boundaries as defined by U.S. Geological Survey hydrologic units and the limits of the range of the red-legged frog. The goal of the draft recovery plan is to protect the long-term viability of all extant populations within each recovery unit. Within each recovery unit, core areas have been delineated and represent contiguous areas of moderate to high red-legged frog densities that are relatively free of exotic species such as bullfrogs. The goal of designating core areas is to protect metapopulations that, combined with suitable dispersal habitat, will allow for the long term viability within existing populations. This management strategy will allow for the recolonization of habitat within and adjacent to core areas that are naturally subjected to periodic localized extinctions, thus assuring the long-term survival and recovery of red-legged frogs.

The action area occurs within the Sierra Nevada Foothills Recovery Unit located in the western foothills of the Sierra Nevada to 1500 m (5000 feet). Within this unit, red-legged frogs seem to have been nearly eliminated from the lower foothill areas near urbanization, occurring only in three isolated populations ranging from 640 to 975 m (2100 to 3200 feet) located in Butte, Yuba, and El Dorado Counties. This recovery unit is essential to the survival and recovery of red-legged frogs as it represents unique morphological (and possible genetic) characteristics implicating a possible genetic divergence from the remaining extant populations of red-legged frogs (Barry 1999), represent a significant portion of the historic geographic range, and possesses extant populations found on the periphery of the current range. Proposed actions will occur on National Forest Land throughout the Sierra Nevada, including areas identified as a Core Areas. Red-legged frogs have been virtually extirpated from the Sierra Nevada..

Red-legged frogs have been observed on lands managed by the Forest Service in Yuba County, on land managed by the Bureau of Land Management in El Dorado County, and on private land in Butte County. The action area currently possesses extensive breeding and nonbreeding habitat that is in immediate need of management actions including restoration, enhancement, and eradication of nonnative predators. The action area represents the integral portion of the historic distribution of California red-legged frogs in the Sierra Nevada and also represents the areas where recovery actions will be focused in the recovery unit.

Status of the Species

Mountain yellow-legged frog

The mountain yellow-legged frog (*Rana muscosa*) is a true frog (family Ranidae). Jennings and Hayes (1994) stated that the mountain yellow-legged frog ranges from southern Plumas County to southern Tulare County in the Sierra Nevada Mountains, at elevations mostly above 1,820 meters (m) (6,000 feet (ft)). The Sierra Nevada Mountain population is known to range in elevation from a low of 1,044 m (3,425 ft) at Pinkard Creek in Butte County (USFS 2000), to over 3,650 m (11,967 ft) near Desolation Lake, Fresno County (Mullally and Cunningham 1956). The mountain yellow-legged frog extends out of California into Nevada in the vicinity of Lake Tahoe and northward on the slopes of Mount Rose (Lindsdale 1940; Zweifel 1955).

Mountain yellow-legged frog populations that occur in the Sierra Nevada Mountains inhabit lakes, ponds, tarns, springs, and streams (Storer 1925; Slevin; 1928; Wright and Wright 1949; Stebbins 1951; Mullally and Cunningham 1956; Zweifel 1968). It is a highly aquatic frog that is found in montane riparian habitat in lodgepole pine, yellow pine, sugar pine, white fir, whitebark pine, and wet meadow vegetation types (Zwifel 1955; Zeiner et al. 1988). Jennings and Hayes (1994) state that mountain yellow-legged frogs appear to prefer open streams and lake margins that gently slope to a depth of 5-8 centimeters (2-3 inches) as this feature allows for oviposition, thermoregulation of larvae and postmetamorphs, and probably protection from fish. Shallow lake margins are used by *R. muscosa* tadpoles to absorb heat and are used by adults as oviposition sites (Jennings and Hayes 1994). Mountain yellow-legged frogs use a variety of stream types that range from rocky, high gradient streams with numerous pools, rapids and small waterfalls to those with marsh edges and sod banks (Zweifel 1955). They are absent from the smallest creeks, presumably due to insufficient water depth for refuge and overwintering (Jennings and Hayes 1994). However, Vredenburg (University of California, Berkeley Museum of Vertebrate Zoology, pers. comm., 2000) states that small creeks will be used if there are large populations in close proximity. Zweifel (1955) reports that mountain yellow-legged frogs prefer alpine lakes with grassy or muddy margins.

The onset of breeding for the mountain yellow-legged frog begins soon after ice melt; in June and July (Grinnell and Storer 1924; Storer 1925; Wright and Wright 1949; Zweifel 1955). Females of the Sierra Nevada mountain yellow-legged frog population deposit their eggs underwater in clusters attached to rocks, gravel, vegetation or under banks (Zweifel 1955). Mountain yellow-legged breeding sites are typically restricted to perennial lakes and ponds because they require between 1 and 2.5 years to develop from fertilization to metamorphosis. In addition, breeding sites need to be sufficiently deep, typically greater than 2 meters so as to not freeze through during the winter (Bradford 1983).

The mountain yellow-legged frog currently remains widely scattered throughout the Sierra Nevada Mountains, however the overall population has declined dramatically. The most pronounced declines have occurred within the northernmost 125 km (78 mi) of the range, north of Lake Tahoe, and the southernmost 50 km (31 mi) of the range, below Sequoia and Kings Canyon National Parks, where only a few populations remain (Jennings and Hayes 1994). Based on information provide by U.S. Geologic Survey (USGS) and the Plumas, Tahoe, El Dorado, and the Stanislaus National Forests, there are few if any known large populations of mountain yellow-legged frogs north of the Sierra National Forest. In areas south of and including the Sierra National Forest down to Sequoia and Kings Canyon National Parks, there are multiple documented sites with large *R. muscosa* populations (32 sites with over 100 adults, 82 sites with 25 or more adults, and 149 sites with 10 or more adults) (Davidson pers. comm. 2000). However, several researchers have noted significant mountain yellow-legged frog population crashes within the last couple years within larger populations (Bradford, Knapp, Lehr pers. comm. 2000).

Adult mountain yellow-legged frogs feed primarily on terrestrial and aquatic invertebrates (Zeiner et al. 1988). Adults also feed on frog and toad larvae including Pacific treefrog (*Hyla regilla*), western toad (*Bufo boreas*) and Yosemite toad (*Bufo canorus*) tadpoles (Mullally 1953, Pope 1999). Larvae feed on algae and diatoms found along rocky stream, lake and pond bottoms (Zeiner et al. 1988).

Environmental Baseline

Mountain yellow-legged frog

Forest Service lands comprise approximately 60-80 percent of the mountain yellow-legged frog's current range. Additional mountain yellow-legged frog populations occur on Yosemite, Sequoia and Kings Canyon National Parks.

A number of natural and anthropogenic factors are responsible for an estimated 70 to 90 percent decline in mountain yellow-legged frog populations throughout the historic Sierra Nevada Mountain range of the species. These factors include: (1) nonnative fish introductions, (2) contaminants, (3) livestock grazing, (4) acidification from atmospheric deposition, (5) nitrate deposition, (6) ultraviolet radiation, (7) drought, and (8) other factors. The introduction of nonnative fish, including rainbow trout (*Oncorhynchus mykiss*), is one the best documented causes of decline of Sierra Nevada Mountain populations of mountain yellow-legged frogs. Careful study of the distributions of introduced trout and mountain yellow-legged frogs for several years has shown conclusively that introduced trout have had negative impacts on mountain yellow-legged frogs over much of the Sierra Nevada Mountains (Bradford 1989; Knapp 1996). Bradford (1989) and Bradford et al. (1994) concluded that introduced trout have eliminated many populations of mountain yellow-legged frogs. In addition, the presence of trout in intervening streams sufficiently isolates other frog populations so recolonization after stochastic (random, naturally occurring) local extinctions is essentially impossible. This mechanism is sufficient to explain the elimination of mountain yellow-legged frogs populations that occur in the Sierra Nevada Mountains from the majority of sites they once inhabited.

Several studies have shown that significant levels of contaminants have been deposited in high Sierran aquatic ecosystems from pesticide drift, acid precipitation, and smog drift (Seiber et al. 1998; Aston and Seiber 1997; Cahill et al. 1996; Miller 1996; Byron and Goldman 1991; Nikolaidis 1991; Laird et al. 1986). The presence of contaminants in water, sediment, and aquatic vegetation can harm frog populations through lethal and sublethal effects including delayed metamorphosis, reduced breeding and feeding activity (Berrill et al. 1993, 1994, 1995, 1998; Boyer and Grue 1995; Beaties and Tyler-Jones 1992; Corn and Vertucci 1992; Hall and Henry 1992). In addition, contaminant introduction may weaken the immune systems of frogs rendering them more susceptible to disease such as chytrid fungus and red-legged disease (Carey et al. 1993, 1995, 1999; Jennings 1996; Drost and Fellers 1996; Sherman and Morton 1993). Research by Davidson (pers. comm. 2000) shows a positive relationship between amphibian declines in the Sierra Nevada Mountains that occur upwind from areas in California's Central Valley that apply large amounts of wind-borne agrochemicals. Specifically, regarding *R. muscosa*, (pers. comm. 2000) found agricultural lands use to be twice as high downwind of sites where *R. muscosa* had disappeared as for sites where the species is still present.

Livestock grazing can directly impact mountain yellow-legged frogs through trampling of individuals. Indirectly, livestock can have a significant effect on frog populations by: (1) altering the hydrology and morphology of high mountain streams and ponds, (2) trampling of cover and vegetation along the periphery of wetland systems that are important egg laying and larval rearing areas, and (3) introducing nitrates into breeding areas resulting in elevated levels of bacteria (Armour et al. 1994; Duff 1977; Bohn and Buckhouse 1985; Kauffman and Krueger 1984; Kauffman et al. 1983; Marlow and Pogacnik 1985; Meehan and Platts 1978; Stephenson and Street 1978; U.S. Forest Service 2000).

Acidification, nitrate deposition, and ultraviolet radiation have been implicated as other factors that may contribute to the range wide decline of *R. muscosa*. These factors may have negative effects on mountain yellow-legged frogs that include reduced growth rates, reduced feeding activity, disequilibrium, physical abnormalities, paralysis, embryonic failure, and even death among tadpoles and young frogs (Blaustein et al. 1994, Bradford and Gordon 1993, Carey et al. 1999, Clark and LaZerte 1985, Freda 1990, Marco et al. 1999, Marco and Blaustein 1999).

Drought is another factor that can negatively impact mountain yellow-legged frog populations. During periods of prolonged drought, amphibians find refugial habitat in deeper, permanent sources of water which are suited for fish. These refugial habitats allow for repopulation of more peripheral areas during wetter years (Bradford et al. 1993; Knapp 1996; Drost and Fellers 1996). The presence of nonnative fish has eliminated many of the permanent sources of refugial habitat from the mountain yellow-legged frog, thus rendering frog populations more vulnerable to drought-related extinction events (Bradford et al. 1993; Knapp 1996; Drost and Fellers 1996).

Disease likely plays a significant role in the widespread decline of mountain yellow-legged frogs. Two such diseases are red-legged disease (*Aeromonas hydrophila*) caused by a freshwater bacteria and chytrid fungus. Bradford (1991) reports the loss of a Sierra Nevada Mountain population of *R. muscosa* due to red-legged frog disease and predation by Brewer's blackbirds (*Euphagus cyanocephalus*). In addition, studies by Sherman and Morton (1993) and Carey (1993) report mortality of adult Yosemite toads (*Bufo canorus*) in the Sierra Nevada Mountains and boreal toads (*Bufo boreas boreas*) in the Rockies due to red-legged disease. Chytrid fungus, an aquatic pathogen discovered after 1993, has led to the mortality of many amphibian species that occur in the United States and worldwide. The chytrid fungus attacks the mouthparts of tadpoles affecting their ability to feed. Chytrids have recently been discovered in the larval mountain yellow-legged frogs in the Sierra Nevada Mountains (Gary Fellers, U.S. Geologic Survey, pers. comm. 1999). Roland Knapp (Sierra Nevada Aquatic Research Lab, pers. comm. 2000) reported a significant decline of mountain yellow-legged frogs at Dry Creek near Mono Lake, a site that had thriving population in 1998. He attributed the population crash to the chytrid fungus after detecting deformed mouthparts in several tadpoles at the site. The petitioners also cite a personal communication with Vance Vredenburg (University of California, Berkeley, Museum of Vertebrate Zoology, pers. comm. 2000) who reported the complete loss of another *R. muscosa* population in the Emigrant Wilderness due to the chytrid fungus. There have been reports of chytrid fungus attacking other Sierra Nevada Mountain amphibians including the Yosemite toad. An investigation of museum specimens of Yosemite toads collected by Sherman and Morton at Tioga Pass during a 1977-1978 die off found those toads to be infected with chytrid fungus (Carey et al. 1999).

Status of the Species

Yosemite toad

The Yosemite toad is a high elevation species that occurs in the central Sierra Nevada Mountains (Stebbins 1966). The range of the Yosemite toad extends from Ebbetts Pass, Alpine County to south of Kaiser Pass and Evolution Lake, Fresno County (Stebbins 1966, Karlstrom 1962, 1973). The Yosemite toad commonly occurs at elevations between 2,438 and 3,047 meters (8,000 and 10,000 feet), with an overall elevation range of 1,950 to 3,500 meters (6,400 to 11,300 feet).

The Yosemite toad is a close relative of three toad species, the western toad (*Bufo boreas*), black toad (*Bufo exsul*) and Amargosa toad (*Bufo nelsoni*) (Blair 1972, Stebbins 1966). Yosemite/western toad hybridization occurs in the northern portion of the Yosemite toad's range in the Blue Lake region of the Carson-Iceberg Wilderness, just southeast of Carson Pass in Alpine County (Karlstrom 1973, Stebbins 1966).

Yosemite toads breed in high mountain montane meadows, shallow snow melt pools, lake margins, and slow moving streams associated with lodgepole (*Pinus contorta*) and whitebark pine (*Pinus albicaulis*) forests (Jennings and Hayes 1994, Karlstrom 1962, Sherman and Morton 1984, Stebbins 1966, Wright and Wright 1949). Within these habitats, Yosemite toads utilize vegetation including thick meadow grass and low-lying willows for cover (Sherman and Morton 1984, 1993). Yosemite toads will also find cover within rodent burrows and under damp surface objects including logs and stones (Karlstrom 1962). During hibernation, Yosemite toads seek out burrows of larger rodents including Belding's ground squirrel (*Spermophilus beldingi*) and marmots (*Marmota flaviventris*) (Sherman 1980). However, Yosemite toads also probably use burrows of smaller rodents including those made by meadow voles (*Microtus montanus*) and pocket gophers (*Thomomys monticola*)(Jennings and Hayes 1994).

Yosemite toads typically hibernate from late September/early October to the spring (April to July) depending on the level of snowfall during the hibernation period and the rate of snow-melt (Davidson 1994, Jennings and Hayes 1994, Karlstrom 1962, Sherman and Morton 1984). After hibernation, Yosemite toads will seek out breeding sites which normally occur within 100 meters (327 feet) of the toad's hibernation site (Grinnell and Storer 1924, Karlstrom 1962, Sherman and Morton 1984). Male toads arrive at the breeding site several days before females and remain at the breeding location for one to several weeks (Grinnell and Storer 1924, Sherman 1980, Sherman and Morton 1984). Females remain at a breeding sites for a short period of time, typically less than one week (Sherman and Morton 1984). Females lay 1,000 to 2,000 eggs that are typically wound around emergent vegetation in shallow water (Davidson 1994, Karlstrom 1962). Studies show a range of egg hatching between 3 to 12 days depending on the temperature (Jennings and Hayes 1994, Sherman 1980, Sherman and Morton 1984). Tadpoles metamorphose 40-50 days after eggs are laid (Jennings and Hayes 1994, Sherman 1980, Sherman and Morton 1984).

Female Yosemite toads begin breeding at 4-6 years of age and males begin breeding at 3-5 years of age (Sherman 1980). Morton (1981) states that female toads probably do not breed every year after reaching sexual maturity. Female Yosemite toads have an estimated live expectancy of 15 years and males 12 years (Sherman and Morton 1984). After breeding, both male and female Yosemite toads disperse into meadow areas where they feed until the onset of hibernation (Grinnell and Storer 1924, Mullally and Cunningham 1956, Sherman 1980, Sherman and Morton 1984). Yosemite toads typically remain within 100 meters (327 feet) of the breeding locations, however Sherman (1980) noted toad movements of between 150-230 meters (490-752 feet) from breeding sites at Tioga Pass Meadow.

Adult Yosemite toads feed on a variety of terrestrial and aquatic invertebrates including tenebronid and lady bird beetles, ants, centipedes, mosquitoes and dragonfly nymphs, and Lepidoptera larva (Grinnell and Storer 1924, Mullally 1953).

Environmental Baseline

Yosemite toad

The project would encompass a large portion (greater than 50 percent) of the Yosemite toads historic range; all sites outside of Yosemite National Park.

Scientific studies have shown that factors including fish stocking, livestock grazing and disease can negatively affect Yosemite toads and their habitat. There are a number of additional factors that have been also be raised as potentially contributing toward Yosemite toad declines including: (1) contaminant introductions, (2) ultraviolet radiation, (3) climatic change, (4) acid deposition, and (5) drought. It is unknown at this time whether the range-wide decline of the species can be attributed to individual factors impacting local toad populations or a combination of factors are working in combination to impact the population as a whole.

Status of the Species

Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) is well known as our nation's symbol. The adult is recognized by its white head and tail contrasting against its dark brown body as well as its wingspan which can be greater than 6.5 feet. The species is long-lived, and individuals do not reach sexual maturity until four or five years of age.

The bald eagle is a generalist and opportunistic predator and scavenger adapted to aquatic ecosystems. It frequents estuaries, large lakes, reservoirs, major rivers, and some seacoast habitats. Its primary foods, in descending order of importance are: fish (taken both alive and as carrion), waterfowl, mammalian carrion, and small birds and mammals. Bald eagles are highly maneuverable in flight and frequently perch-hunt. Diurnal perches are used during foraging; these usually have a good view of the surrounding area and are often the highest perch sites available (Stalmaster 1976, USFWS 1986). They are also known to hunt by coursing low over the ground or water. In general, foraging habitat consists of large bodies of water or free-flowing rivers with abundant fish and adjacent snags and other perches (Zeiner et al. 1990).

Breeding generally occurs February to July (Zeiner et al. 1990) but breeding can be initiated as early as January 1 via courtship, pair bonding, and territory establishment. The breeding season normally ends approximately August 31 when the fledglings have begun to disperse from the immediate nest site. This time frame may vary with local conditions and knowledge. One to three eggs are laid in a stick platform nest 50 to 200 feet above the ground and usually below the tree crown (Zeiner et al. 1990). Incubation may begin in late February to mid-March, with the nestling period extending to as late as the end of June. From June thru August, the fledglings remain restricted to the nest until they are able to move around within their environment. Bald eagles are susceptible to disturbance by human activity during the breeding season, especially during egg laying and incubation, and such disturbances can lead to nest desertion or disruption of breeding attempts (USFWS 1986).

Nesting territories are normally associated with lakes, reservoirs, rivers, or large streams and are usually within two miles from water bodies that support an adequate food supply (Lehman 1979, USFWS 1986). Some of the State's breeding birds winter near their nesting territories. Most nesting territories in California occur from 1000 to 6000 feet elevation, but nesting can occur from near sea level to over 7000 feet (Jurek 1988).

In the Pacific Northwest, bald eagle nests are usually located in uneven-aged (multi-storied) stands with large, old trees (Anthony et al. 1982). Most nests in California are located in ponderosa pine and mixed-conifer stands and nest trees are most often ponderosa pine (*Pinus ponderosa*) (Jurek 1988). Other site characteristics, such as relative tree height, tree diameter, species, position on the surrounding topography, distance from water, and distance from disturbance, also appear to influence nest site selection (Lehman et al. 1980, Anthony and Isaacs 1981). Bald eagles often construct up to five nests within a territory and alternate between them from year to year (USFWS 1986). Nests are often reused and eagles will add new material to a nest each year (DeGraaf et al. 1991).

Trees selected for nesting are characteristically one of the largest in the stand or at least co-dominant with the over story, and usually have stout upper branches and large openings in the canopy that permit nest access (USFWS 1986). Nest trees usually provide an unobstructed view of the associated water body and are often prominently located on the topography. A survey of nest trees used in California found that about 71 percent were ponderosa pine, 16 percent were sugar pine (*Pinus lambertiana*), and 5 percent were incense-cedar (*Librocedrus decurrens)*, with the remaining 8 percent distributed among five other coniferous species (Lehman 1979).

Seventy percent of the nest trees surveyed were classified as highly or very highly susceptible to beetle infestation, probably a function of eagle's using mature and over mature trees. Ninety-three percent of the nest trees were 21-60 inches in diameter (mean diameter was 43.1 inches) and 92 percent were greater than 76 feet tall (mean height was 111.9 feet). Seventy-three percent of the nest sites were within one-half mile of a body of water, 87 percent within one mile, and none were over two miles from water. Other trees, such as snags, trees with exposed lateral limbs, or trees with dead tops, are often also present in nesting territories and are used for perching or as points of access to and from the nest. Such trees also provide vantage points from which territories can be guarded and defended. Nearby trees may also screen the nest from human disturbances or provide protection from wind damage (Jurek 1988).

Wintering habitat is associated with open bodies of water, primarily in the Klamath Basin (Detrich 1981, 1982). Smaller concentrations of wintering birds are found at most of the larger lakes and man-made reservoirs in the mountainous interior of the north half of the state and at scattered reservoirs in central and southwestern California. Wintering habitat on the ten affected Forests has primarily remained in stable condition over the past ten years.

Two habitat characteristics appear to play a significant role in habitat selection during the winter: diurnal feeding perches, as described above, and communal night roost areas. Communal roosts are usually near a rich food resource (USFWS 1986), although Keister and Anthony (1983) found that bald eagles used forest stands with older trees as far as 9.6 miles from the food source in the Klamath Basin. The areas used as communal roosts in the Klamath Basin were the forest stands with old (mean age of roost trees was 236 years), open-structured trees that were close to the feeding areas. In stands where ponderosa pine was dominant, the pine was used almost exclusively for roosting. In forest stands that are uneven-aged in the Pacific Northwest, communal roosts have at least a remnant of large, old trees (Anthony et al. 1982).
Most communal winter roosts used by bald eagles throughout the recovery areas offer considerably more protection from the weather than diurnal habitat (USFWS 1986). Human activity near wintering eagles can adversely affect eagle distribution and behavior (Stalmaster and Newman 1978).

The bald eagle once nested throughout much of North America near coasts, rivers, lakes, and wetlands. The species suffered population declines throughout most of its range, including California, due primarily to environmental contamination as with the use of DDT and other persistent organochlorine compounds, habitat loss and degradation, shooting, and other disturbances (USFWS 1986). The drastic decline of the species led to its listing on February 14, 1978, and protection under the Act (43 **FR** 6230). A Recovery Plan was released in 1986 for the recovery and maintenance of bald eagle populations in the 7-state Pacific recovery region (Idaho, Nevada, California, Oregon, Washington, Montana, and Wyoming) (USFWS1986). In recent years, the status of bald eagle populations has improved throughout the United States. The bald eagle was downlisted from endangered to threatened on July 12, 1995, throughout the lower 48 states (60 **FR** 36000). A proposed rule to remove the species from the list of endangered and threatened wildlife was made on July 6, 1999 (64 **FR** 36454). Critical habitat has not been designated for this species. In addition to the Act, the bald eagle is protected under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§703-712) and the Bald Eagle Protection Act of 1940, as amended (16 U.S.C. §§668-668d).

Today the bald eagle continues to be found throughout much of North America and breeds or winters throughout California, except in the desert areas (Zeiner et al. 1990, DeGraaf et al. 1991). In California, most breeding occurs in Butte, Lake, Lassen, Modoc, Plumas, Shasta, Siskiyou, and Trinity Counties (Zeiner et al. 1990). California's breeding population is resident year-long in most areas as the climate is relatively mild (Jurek 1988). Between mid-October and December, migratory bald eagles arrive in California from areas north and northeast of the state. The wintering populations remain in California through March or early April.

Bald eagles are susceptible to disturbance by human activity (such as recreational activities, fluctuating fish populations and number of roost trees as a result of reservoir level fluctuations, risk of wild fire, fragmentation of habitat, home sites, campgrounds, mines, timber harvest, and roads) during the breeding season, especially during egg laying and incubation; such disturbances can lead to nest desertion or disruption of breeding attempts. Human activities are more disturbing when located near bald eagle roosting, foraging, and nesting areas (USFWS 1986).

Many studies have documented a threshold at which human activities elicit response for eagles (Stalmaster and Newman 1978, Knight and Knight 1984, Steidl and Anthony 1996), though other studies show little direct effect of human activities on bald eagle nesting attempts (Mathisen 1968, Fraser et al.1985, Anthony et. al. 1996). Human induced failures are likely one-time catastrophic events occurring near nests early in the nesting season. Several authors have demonstrated that nesting and foraging eagles avoid areas of human use or development (Buehler et. al. 1991, McGarigal et. al. 1991, Brown and Steven 1997). Individual pairs of nesting bald eagles exhibit varying level of tolerance to disturbance throughout the breeding season and during periods of foraging.

The California Department of Fish and Game has maintained a fish stocking program throughout California's system of lakes, reservoirs and rivers. This has provided an abundant prey base of fish for the bald eagle. In the northern California lakes, 4,000 pounds of salmonids are stock in approximately 57 bodies of water each year. That includes approximately 200 to 350 pounds of fish in the 10 to 12 inch range. For recreational fishing, 70,000 pounds of fish averaging approximately 0.5 pound each are annually stocked in approximately 62 different bodies of water in the southern Sierra Nevada. In stocking programs in northern California, up to 20 percent of the released hatchery trout may die soon after release and many initially inhabit the top of the water column because of increased oxygen levels there. In one study, bald eagles had been observed taking fish carrion at the stocking location on Shasta Lake (Detrich 1977).

Though the construction of dams has limited the range of anadromous fish, an important historic bald eagle prey base, reservoirs construction and the stocking of fish in reservoirs in the west has provided bald eagles with habitat for population expansion following their mid-century decline due to DDT poisoning, degradation of historical nesting habitat, and persecution (Detrich 1986, 1989). Food habitat studies of reservoir-nesting bald eagles in the west have focused on populations in northern California and Arizona (Hunt et. al. 1992, Jackman et. al. 1999).

Environmental Baseline

Bald eagle

Nesting and/or wintering bald eagles occurs on all the Forests affected by the proposed project: Modoc; Lassen; Plumas; Tahoe; Eldorado; Lake Tahoe Basin; Stanislaus; Sierra; Sequoia; and Inyo (Timossi 1990). Based upon annual wintering surveys, it is estimated that between 100-300 bald eagles winter on these forests. A total of fifty five known breeding territories are known to occur on five of these Forests (CDFG 1998).

The California bald eagle nesting population has increased in recent years from under 30 occupied territories in 1977 to 151 occupied territories in 1999 (Jurek, 2000). Most of the breeding population is found in the northern third of the state, primarily on public lands. 70 percent of nests surveyed in 1979 were located near reservoirs (Lehman 1979) and this trend has continued, with population increases occurring at several reservoirs since the time of that study.

In the Pacific recovery region, which contains all of the 10 affected Forests, reclassification goals as set forth in the Recovery Plan (USFWS 1986) have been met. The proposed action would occur in six of the 15 Recovery Zones within California. As described in the following table, the number of occupied territories have increased in all six of these Recovery Zones (CDFG 1998).

Recovery Zone	Occupied Territories		# Breeding Territories on USFS Ownership within Project Area	Recovery Goal
	1988	1997		
21-Harney-Warner Mountains	1 CA/ 0 OR	10 CA / 1 OR	10	10
22- Klamath Basin	9 CA / 57 OR	17 CA/ 97 OR	8	80
25 - Pit River	12	26	8	21
26 - Lassen-Plumas	20	31	24	27

27 - Sac. Valley /Foothills	3	9	1	8
28 - Sierra Nevada	2	9	4	15

The observed increase in populations is believed to be the result of a number of protective measures enacted throughout the range of the species since the listing of the species. These measures and recovery accomplishments include the banning of the pesticide DDT, stringent protection of nest sites, and protection from shooting.

Status of the Species

California Condor

The California condor (*Gymnogyps californianus*) was federally listed as endangered on March 11, 1967 (32 **FR** 4001), and state listed as endangered on June 27, 1971. Critical habitat was designated on September 24, 1976 (41 **FR** 187), in Tulare, Kern, Los Angeles, Ventura, Santa Barbara, and San Luis Obispo Counties. The *Condor Recovery Plan* (Service 1996) was revised in 1996.

California condors are among the largest flying birds in the world. Adults weigh approximately 10 kilograms and have a wing span up to 2.9 meters. Adults are black except for prominent white underwing linings and edges of the upper secondary coverts. The head and neck are mostly naked, and the bare skin is gray, grading into various shades of yellow, red, and orange. Males and females cannot be distinguished by size or plumage characteristics. The heads of juveniles up to 3 years old are grayish-black, and their wing linings are variously mottled or completely dark. During the third year the head develops yellow coloration, and the wing linings become gradually whiter. By the time individuals are 5 or 6 years of age, they are essentially indistinguishable from adults but full development of adult wing patterns may not be complete until 7 or 8 years of age.

Courtship and nest site selection by breeding California condors occur from December through the spring months. Nesting occurs in various rock formations including crevices, overhung ledges, and potholes, and, more rarely, in cavities in giant sequoia trees (*Sequoia gianteus*). Reproductively mature, paired California condors normally lay a single egg between late January and early April. The egg is incubated by both parents and hatches after approximately 56 days. Both parents feed the nestling, typically daily for the first two months but gradually diminishing in frequency over time. Chicks take their first flight at about six to seven months of age, and typically become fully independent the following year. California condors reach sexual maturity by five or six years of age.

California condors are opportunistic scavengers, feeding only on carcasses of dead animals. Typical foraging behavior includes long-distance reconnaissance flights, lengthy circling flights over a carcass, and hours of waiting at a roost or on the ground near a carcass. Once on the ground, California condors may feed immediately or wait passively as other California condors or golden eagles feed on the carcass. California condors have been observed feeding on 24 different mammalian species, although historically, the most common large species scavenged were probably mule deer (*Odocoileus hemionus*), tule elk (*Cervus elaphus nannoides*), pronghorn *(Antilocapra americana*), and along the Pacific coast, whales, seals and sea lions (*Zalophus californianus*). Following the arrival of European man, cattle, domestic sheep, mule deer, and horses became, proportionally, the most important component of the diet of California condors.

During the Pleistocene era (10,000 to 100,000 years ago) the California condor ranged from British Columbia, Canada to Baja California, Mexico and through the southwest to Florida and north to New York State. With the extinction of the large Pleistocene Era mammals, condors declined in range and numbers. Another large decline occurred when European settlers arrived on the West Coast, and accelerated during the gold rush of 1849. Condors were wantonly shot and poisoned, and eggs and adults were collected. By 1940, the condors' range was reduced to a horseshoe-shaped area in southern California that included the coastal mountain ranges of San Luis Obispo, Santa Barbara and Ventura Counties; a portion of the Transverse Range in Kern and Los Angeles Counties; and the Southern Sierras in Tulare County. The last wild condor was captured in 1987; young birds raised in captivity have been reintroduced into the wild in western Monterey County, eastern San Luis Obispo County, and eastern Santa Barbara County in California, and near the Grand Canyon in Arizona.

The principal foraging regions used by condors since the late 1970s have been the foothills bordering the southern San Joaquin Valley and axillary valleys in San Luis Obispo, Santa Barbara, Kern, and Tulare Counties. Typically, foraging sites are in grasslands or oak-savannah regions at lower elevations, and roosting and nesting sites are located at higher elevations on cliffs. The important foraging areas are primarily private grazing lands.

The California condor declined over the past century to such a low level that only 21 individuals existed in 1982. Reasons for decline include human persecution, egg collecting, pesticides, lead poisoning, habitat loss, and the decline of its prey base of large and medium-size native mammals due to encroachments of agriculture and urbanization. Since reintroduction, five birds have died from colliding with power lines. Because of deaths from contact with power lines, condors started undergoing power line aversion training in 1995 before their release. In 1997, two more condors died as a result of power line

Environmental Baseline

California condor

To assist in the recovery of condors, a captive breeding program was established in 1981 to provide captive-reared condors to release to the wild. The Service began reintroducing California condors to the wild in 1992, and as of March 26, 1999, 34 birds in California and 22 birds in Arizona are being closely monitored in the wild. No birds have bred yet in the wild.

The 1996 recovery plan for the California condor designated a range of primary concern for the condor that encompasses six counties just north of Los Angeles, California. This range of primary concern incorporates large portions of Tulare and Kern Counties including lands that occur on the Sequoia National Forest.

Status of the Species

California spotted owl

The California spotted owl is one of three recognized subspecies of spotted owls, including the northern spotted owl, (*Strix occidentalis caurina*) and the Mexican spotted owl (*Strix occidentalis lucida*) (AOU 1957). The spotted owl is a brown, medium sized (16-19 inches tall) owl covered with irregular white spots. Its dark brown back contrasts with lighter underparts and the legs and toes are covered by buffy feathers. The tail is barred with about ten narrow light brown bands. Spotted owls do not have ear tufts and the facial disk is pale brown, surrounded by dark brown. Lighter “eyebrows” and “whiskers” form a distinctive X between the eyes, which are brown. The bill is horn colored to light yellow. Claws are dark brown to black (Johnsgard 1988, Gutiérrez et al. 1995). The sexes are mostly similar, with females larger than males on average (Blakesley et al. 1990). Late-year juveniles are distinguished by clear, white pointed tail feathers (Forsman 1981, Moen et al. 1991). Coloration is progressively lighter brown and spots are progressively larger from northern to California to Mexican spotted owl.

The Mexican spotted owl ranges from southern Utah and Colorado south 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 (USDI 1993) and its range is disjunct from the other subspecies. The northern spotted owl ranges from southwestern British Columbia through western Washington, western Oregon, and northern California south to San Francisco Bay (USDI 1990). The range of the northern spotted owl includes a small portion of both the Modoc and Lassen National Forests, generally north of the Pit River and west of Highway 139. The California spotted owl's range adjoins that of the northern spotted owl in Siskiyou, Shasta, and Modoc Counties (USDI 1990). Barrowclough et al. (1999) found evidence of gene flow between northern and California spotted owls, but concluded that it is a recent and uncommon phenomenon.

The range of the California spotted owl includes the southern Cascades south of the Pit River in Shasta County, the entire Sierra Nevada Province of California (and extending into Nevada), all mountainous regions of the Southern California Province, and the central Coast Ranges at least as far north as Monterey County (Grinnell and Miller 1944, Gould 1977). Within this range, the owl occurs on 15 National Forests/Management Units administered by the Forest Service, four National Parks, several State Parks and Forests, private timberlands, scattered Bureau of Land Management lands, and tribal lands. The elevation of known nest sites ranges from about 1000 feet to 7700 feet, with about 86 percent occurring between 3000 and 7000 feet.

The California spotted owl population has two major geographic groups, one inhabiting the Sierra Nevada Province and the other in the Southern California Province, with Tehachapi Pass as the dividing line between the two. In conifer forests, mean elevation of nest sites was 5300 feet in the northern Sierra Nevada and 6000 feet in southern California (Gutiérrez et al. 1992). These regions are distinct geographically. In the Sierra Nevada the California spotted owl is mostly continuously and uniformly distributed, with several breaks in distribution where habitat appears limited due to natural or human caused factors (Beck and Gould 1992). In southern California, the owl occupies "islands" of high elevation forests isolated by lowlands covered by chaparral, desert scrub, and increasingly (Noon and McKelvey 1992), human development (LaHaye et al. 1994). Owl populations in the two provinces probably seldom exchange individuals, but connectivity may exist through the Tehachapi Mountains and the Liebre/Sawmill area east of Interstate Highway 5.

Unlike northern spotted owls, some California spotted owls migrate altitudinally, moving downslope for the winter. Spotted owls migrated a mean straight-line distance of twenty miles in the Eldorado National Forest and a mean of 12.3 miles in the Sierra National Forest (Verner et al. 1992b). Three studies tracked 32 California spotted owls to determine whether they migrated: 44 percent were altitudinal migrants. The reasons why only some individuals migrate are unclear. Migration may expose owls to greater risk of mortality. Human use and development in traditional wintering areas may also have adverse impacts on the quality of owl habitat.

California spotted owls are considered prey specialists (Verner et al. 1992b) because they select a few key species (Verner et al. 1992b) among the variety of taxa on which they prey, which includes mammals, birds, and insects (Barrows 1980, Hedlund 1996, Marshall 1942, Smith et al. 1999, Thrailkill and Bias 1989). In the upper elevations of the Sierra Nevada, the primary prey is the northern flying squirrel (*Glaucomys sabrinus*) (Verner et al. 1992b). In lower elevations of the Sierra Nevada and in Southern California, the primary prey is the dusky-footed woodrat (*Neotoma fuscipes*) (Thrailkill and Bias 1989). Both flying squirrels and woodrats occur in the diets of owls in the central Sierra Nevada (Verner et al. 1992b).

Spotted owls are territorial. Non-territorial owls ("floaters") may also exist in populations and occupy territories after they are vacated (Gutiérrez 1994, LaHaye et al. 1994). Estimates of California spotted owl home range size are extremely variable. Based on an analysis of data from telemetry studies of California spotted owls, mean breeding season, pair home range sizes have been estimated (using 100 percent minimum convex polygon method): 9,000 acres on the Lassen National Forest, true fir type; 4,700 acres on the Tahoe and Eldorado National Forests, mixed conifer type; and 2,500 acres on the Sierra National Forest, mixed conifer type. All available data indicate that home ranges are smallest in habitats at relatively low elevations that are dominated by hardwoods, intermediate in size in conifer forests in the central Sierra Nevada, and largest in the true fir forests in the northern Sierra Nevada (Verner et al. 1992). Home ranges of owls in areas where the primary prey is northern flying squirrels are consistently larger than those where the primary prey is dusky-footed woodrats presumably because woodrats occur in greater densities and weigh more than flying squirrels (Zabel et al. 1992a). As of 1992, approximately 25 percent of known owl sites were found where woodrats are the primary prey species and 75 percent of sites were found where flying squirrels are the primary prey species (Verner et al. 1992b).

The spotted owl breeding cycle extends from about mid-February to mid- to late September. Egg-laying through incubation, when the female spotted owl must remain at the nest, extends from early April through mid- to late May. California spotted owls nest in a variety of tree/snag species in pre-existing structures such as cavities, broken top trees, and platforms such as mistletoe brooms, debris platforms and old raptor or squirrel nests (Gutiérrez et al. 1992, 1995). Young owls typically fledge from the nest in mid- to late June. In the weeks after fledging, the young are very weak fliers and remain near the nest tree. Adults continue to bring food to the fledglings until mid- to late September when the young disperse. Summarized information on the dispersal abilities of California spotted owls is scant. Information in Verner et al. (1992) indicates that two-thirds of the juveniles would be expected to disperse at least eight miles. Information is also lack on what constitutes habitat suitable for California spotted owl dispersal.

Not all pairs of California spotted owls nest every year. In fact, over the ten years of demographic studies in the Sierra Nevada, 1992 was the only year when nearly all study owls nested. It is not unusual for owls in an established activity center to skip several years between one nesting and the next. Sites may be vacant for several consecutive years when the population is in decline, but then be reoccupied to support breeding pairs during a population upswing. Spotted owls as a species have apparently evolved high adult survival rates associated with irregular and unpredictable reproduction (Noon and Biles 1999), where a long life span allows eventual recruitment of offspring even if recruitment does not occur each year (Franklin et al. 2000). Spotted owls are long-lived (owls in the wild have been known to be 17 years old) and adult survival rates in the Sierra Nevada are relatively high (greater than 0.80; Noon et al. 1992, Blakesley and Noon 1999, Steger et al. 1999), indicating the species may be able to persist over the short-term even with extensive reduction in the amount of its suitable habitat (Noon et al. 1992).

In the Sierra Nevada, 80 percent of spotted owl sites have been found in mixed conifer forests (sugar and ponderosa pine, white fir, Douglas-fir, giant sequoia, incense-cedar, black oak, and red fir), 10 percent in red fir forests (red and white fir, lodgepole pine, and quaking aspen) 7 percent in ponderosa pine/hardwood forests (ponderosa pine, interior and canyon live oak, black oak, incense-cedar, white fir, tanoak, and Pacific madrone), and 3 percent in other forest types such as east-side pine (ponderosa and Jeffrey pine), and foothill riparian/hardwood (cottonwood, California sycamore, interior live oak, Oregon ash, and California buckeye) (Verner et al. 1992a).

California spotted owls use a broader range of habitat types than the northern spotted owl (Call et al. 1992, Gutiérrez et al. 1992, Anderson and Mahato 1995, Moen and Gutiérrez 1997, North et al. 2000), in part due to the relatively more complex landscapes available to the former subspecies (Zabel et. al 1992b, Franklin and Fites-Kaufmann 1996, Helms and Tappeiner 1996, Beardsley et al. 1999). In the Sierra Nevada, this complexity reflects: (1) the variety of environmental conditions due to elevation, latitude, geology, precipitation, and temperature; (2) rich flora, and (3) influence of natural disturbance, especially fire (Andersen and Mahato 1995) and human disturbance (Franklin and Fites-Kaufmann 1996). The forests of the Sierra Nevada have a complex logging history dominated by selection methods (Beardsley et al. 1999) varying by number of entries, types of species harvested, size distribution of harvested trees, and total volume logged (Zabel et al. 1992b). The heterogeneity of forests occupied by California spotted owls make quantifying its habitat difficult and sensitive to scale. Several studies have found that analysis of habitat at a coarse, small scale (e.g. using timber type polygons) masks fine grained attributes used or selected by owls (Bias and Gutiérrez 1992, Zabel et al. 1992a, Moen and Gutiérrez 1997).

Despite the complexity of California spotted owl habitat, several authors have concluded the subspecies is a habitat specialist (Andersen and Mahato 1995, Moen and Gutiérrez 1997, LaHaye et al. 1997), selecting habitat at several scales. California spotted owls, like the other subspecies of spotted owls, use or select habitats for nesting, roosting, or foraging that have structural components of old forests, including large (typically greater than 61 cm (24 inches) diameter at breast height (dbh)) (Call 1990, Gutiérrez et al. 1992, Zabel et al. 1992a, Moen and Gutiérrez 1997, USDA 2000), decadent trees (trees with cavities, broken tops, etc.); high density of trees (Laymon 1988, Call 1990, Bias and Gutiérrez 1992, Gutiérrez et al. 1992, LaHaye et al. 1997, Moen and Gutiérrez 1997); multi-layered canopy/complex structure (Call 1990, Gutiérrez et al. 1992, LaHaye et al. 1997, Moen and Gutiérrez 1997); high canopy cover (greater than 40 percent and mostly greater than 70 percent; Laymon 1988, Bias 1989, Bias and Gutiérrez 1992, LaHaye et al. 1992a, Gutiérrez et al. 1992, Zabel et al. 1992a, Moen and Gutiérrez 1997, North et al. 2000); snags (Laymon 1988, Call 1990, Bias and Gutiérrez 1992, Gutiérrez et al. 1992, LaHaye et al. 1997); and logs (Call 1990). Gutiérrez et al. (1992) noted that these characteristics applied to mixed conifer forests because riparian/hardwood forests occupied by California spotted owls did not necessarily have these characteristics.

Six major studies (Gutiérrez et al. 1992) described habitat relations of the owl in four general areas spanning the length of the Sierra Nevada. These studies examined spotted owl habitat use at three scales: landscape; home range scale; and nest, roost, or foraging stand. By comparing the amount of time owls spend in various habitat types to amount of habitat available, researchers determined that owls preferentially used areas with at least 70 percent canopy cover, used habitats with 40 to 69 percent canopy cover in proportion to its availability, and spent less time in areas with less than 40 percent canopy cover than might be expected.

In studies referenced by Gutiérrez et al. (1992), owls foraged most commonly in intermediate- to late-successional forests with greater than 40 percent canopy cover and a mixture of tree sizes, some larger than 24 inches in dbh. The owls consistently used stands with significantly greater canopy cover, total live tree basal area, basal area of hardwoods and conifers, snag basal area, and dead and downed wood, when compared with random locations within the forest. Studies on the Tahoe National Forests found that owls foraged in stands with large diameter trees significantly more than expected based on availability. In radio tracking studies, the area including half of the foraging locations of owls was found to vary from an average of 317 acres on the Sierra National Forest to an average of 788 acres on the Lassen National Forest (Verner et al. 1992:87).

Several studies have identified foliage height class diversity, or canopy layering, as a stand structural characteristic associated with preferred foraging sites for the California (North et al. 1999) or northern spotted owl (Carey et al. 1992). In general, stands suitable for owl foraging have (1) at least two canopy layers, (2) dominant and codominant trees in the canopy averaging at least eleven inches in dbh, (3) at least 40 percent canopy cover in overstory trees, (30 percent canopy cover in the red fir type), and higher than average numbers of snags and downed woody material. California spotted owls forage in forests with ample open flying space within and beneath the canopy (Gutiérrez et al. 1995), therefore extremely dense stands may not be used for foraging. Although canopy covers down to 40 percent are suitable for foraging, they appear to be only marginally so. Radio-tracking data from the Sierra National Forest showed that owls tended to forage more in sites with greater than 50 percent canopy cover than predicted from their availability; stands with 40 to 50 percent canopy cover were used about in proportion to their availability (Verner pers. comm. 1999). The subspecies avoids open (0-30 percent canopy cover; Gutiérrez et al. 1992) or logged (Call 1990, Zabel et al. 1992b, Gutiérrez and Pritchard 1990) areas.

In studies referenced by Gutiérrez et al. (1992), spotted owls preferred stands with significantly greater canopy cover, total live tree basal area, basal area of hardwoods and conifers, and snag basal area for nesting and roosting. In general, stands suitable for nesting and roosting have (1) two or more canopy layers, (2) dominant and codominant trees in the canopy averaging at least 24 inches in dbh, (3) at least 70 percent total canopy cover (including the hardwood component), (4) higher than average levels of very large, old trees, and (5) higher than average levels of snags and downed woody material.

Classification of 292 California spotted owl nest and roost sites of the Lassen, Eldorado, and Sierra National Forests, and in Sequoia/Kings Canyon National Park since publication of the Technical Report resulted in approximately 32 percent of the plots classified as CWHR structural class 6, 18 percent as structural class 5M, 14 percent as 4D, 11 percent as 4M, 9 percent as 5D, 7 percent as 5P, and 5 percent as 4P, with 2 percent or less of the remaining plots as each of the 5S, 4S, 3D, 3M, and 3P classes. North et al. (2000) suggested that canopy cover, tree density, and foliage volume represent conditions found to be consistent across different forest types and therefore could indicate the basic nest-site conditions selected by owls. Owl nests were consistently located in sites with 75 percent canopy cover, 300 stems/ha, and 40,000 cubic meters/ha of foliage volume.

Nest trees are often large, over 89 cm (35 inches) average dbh (Gutiérrez et al. 1992, Steger et al. 1997, LaHaye et al. 1997), and larger than other trees in the same stand (Gutiérrez et al. 1992). Nest trees are also often greater than 200 years old (Gutiérrez et al. 1992, North et al. 2000). However, approximately 25 percent of nest trees out of a sample of over 250 were less than 76 cm (30 inches) dbh (Gutiérrez et al. 1992). Although old, large trees are important to California spotted owls, intermediate-sized (28-61 cm (11-24 inch)) trees were also selected by nesting (LaHaye et al.1997; trees 51-76 cm (20-30 inches) dbh), roosting (Moen and Gutiérrez 1997), and foraging (Laymon 1988) owls.

Blakesley and Noon (2000) suggested that the most positive step that can be taken to reverse apparent declines of California spotted owls is increasing retention and recruitment of large trees and retention of closed-canopy conditions throughout the Sierra Nevada landscape. Verner et al. (1992) found the mean size of nest stands to be about 100 acres and the mean size of the nest stand plus adjacent suitable stands about 300 acres. The Forest Service's Science Report highlighted new information on the importance of large, old trees within spotted owl habitat, reporting that "Region 5 data on known ages and diameters of conifers at least 39 inches in dbh (but not owl nest trees) from the seven westside Sierra Nevada National Forests demonstrate that tree ages in different timber strata were 157 to 438 years old, with an average age of 258 years. "Most strata-level age estimates averaged between 250 and 300 years" (Verner and McKelvey 1994). "These findings suggest that the spotted owl requires large conifers 250 or more years old distributed at the landscape scale." Gutiérrez et al. 1992 found California spotted owls to more consistently selected for habitat patches with high canopy cover than for large tree size-class. The average proportion of habitat with greater than 40 percent canopy cover within home ranges of spotted owls on the Sierra and Lassen National Forests was 81 and 67 percent, respectively (Gutiérrez et al. 1992a).

In 1992, Noon and McKelvey stated: "We must be able to target for preservation those habitats needed today for the species' persistence and learn how to manage for such habitats in the future. Only by understanding the relations between demographic rates and the structure and composition of vegetation at the stand level can we be certain of maintaining habitat that provides for a stable or growing population". This requires mapping of vegetation attributes important to the spotted owl across large areas and analyzing relations between vegetation and spotted owl productivity and survivorship. As stated in the FEIS, such efforts are in progress for the demographic study areas in the Sierra and Lassen National Forests. Recent analysis by

Hunsaker et al. (in press) found that productivity was positively correlated with the proportion of greater than 50 percent canopy-cover in analysis areas. For sites that consistently produced young, the median proportion of habitat with canopy cover greater than 50 percent was usually 10 percent higher than for unproductive sites. For the largest analysis area (90 percent of minimum convex polygon), productive sites had a median of 60 percent of canopy cover greater than 50 percent. According to the FEIS, similar analyses for northern spotted owls (Bart 1995) revealed that increasing amounts of habitat did not show a threshold value above which little or no increase in productivity or survival occurred, suggesting that removing any suitable habitat within the vicinity of the nest tends to reduce the productivity and survivorship of owls and that habitat in all home ranges cannot be reduced to a threshold level without adverse effects on the population.

Bingham and Noon (1997) found the "overused" portion of both northern and California spotted owls' breeding home range (core area) to be 20 to 21 percent of the home range. Results of Hunsaker et al. were consistent with the core area concept because median values of tree canopy cover were highest in the area immediately centered on nest or roost sites, and decreased with distance from these central areas. Comments submitted to the Forest Service on the DEIS by retired Forest Service owl biologist Dr. Jared Verner stated "this is clearly a significant result that needs to be addressed in all future management for spotted owls in the Sierra Nevada".

Information on the desired configuration or patchiness of habitat within a spotted owl's home range is lacking for the California spotted owl. Demographic studies on the northern spotted owl in the Klamath Province have found that birds with access to larger blocks of suitable habitat had slightly lower mortality rates, but those with home ranges that were more patchy had slightly higher fecundity (number of young produced per breeding female). A landscape pattern with some fine-scale fragmentation of old forest (small patches of other habitats with convoluted edges) dispersed within and around a main patch of old forest appeared to provide the optimum balance in promoting both high fecundity and high survival (Franklin et al. 2000). A comparison of demographic data from spotted owls on the Sequoia/Kings Canyon National Parks with those on the Sierra National Forest found that spotted owls on the National Forest average slightly higher fecundity but owls on the National Park had slightly higher annual survival. Although the differences are not significant statistically, the general results are consistent with those found in the Franklin et al. study, assuming that habitat on National Forest lands is patchier than that found on National Park lands (Verner, pers. comm. 1999).

The California spotted owl is recognized as a sensitive species by the Forest Service and a species of special concern by the California Department of Fish and Game. On April 3, 2000, the U.S. Fish and Wildlife Service received a petition to list the California spotted owl as either threatened or endangered under the Endangered Species Act. The petition was submitted by the Center for Biological Diversity, Tucson, Arizona and Sierra Nevada Forest Protection Campaign, Sacramento, California, who filed the petition on behalf of themselves and 14 other organizations. On October 12, 2000, the Service found the petition presented substantial information that listing the California spotted owl may be warranted. The Service found that California spotted owls have experienced significant population declines and their habitats are subject to present and future destruction or modification by timber management and related activities, urbanization and its consequences such as increased recreation and disturbance, and catastrophic fire. The Service also found that climate alone or in conjunction with habitat degradation may also contribute to declines of spotted owl populations. Finally, the Service found that existing regulatory mechanisms and the Forest Service's interim guidelines were inadequate to protect the California spotted owl and its habitat, warranting protection of the subspecies under the Act. This finding initiated a status review of the subspecies, but on November 17, 2000, the Director of the Fish and Wildlife Service placed a moratorium in fiscal 2001 on listing actions that were not court-mandated.

Environmental Baseline

California spotted owl

Information on the historic distribution, abundance, and habitat associations of California spotted owls in the Sierra Nevada is unavailable (Verner et al. 1992). Based on records from the California Department of Fish and Game recorded through 1999, a total of 1,323 owl sites are known on Forest Service lands within the project area, with another 129 owl sites reported on non-Forest Service lands within the boundaries of the project area. The Lassen, Plumas, Tahoe, Eldorado, Stanislaus, Sierra, and Sequoia National Forests have major populations of spotted owls, with 99 percent of the total known owl sites on Forest Service lands in the project area occurring within these forests. These seven National Forests include the vast majority of suitable habitat for spotted owls in the Sierra Nevada. Numbers of California spotted owls are low on the Modoc, Inyo, and Humboldt-Toiyabe National Forests, and in the Lake Tahoe Basin Management Unit, and reproduction is infrequent**.** Private land comprises a portion of the home ranges of some owl sites on Forest Service lands, with more than 15 percent of the owl sites on Forest Service lands having greater than 15 percent of their home range within privately owned lands. Four National Parks, scattered Bureau of Land Management lands, industrial timberlands, private timberlands, and tribal lands provide the remainder of the estimated suitable habitat and additional spotted owl pairs. Approximately 600 individual California spotted owls (about 300 sites) have been found in southern California in 15 populations comprised of 3-270 individuals, and separated from each other by 10-72 km (6-45 miles) (Verner et al. 1992a, Gutiérrez 1994).

Number of California spotted owl sites by status known on Forest Service lands and non-Forest Service lands, since 1987, within the boundaries of the National Forests in the project area reported in the California Department of Fish and Game database (Fall 1998).

National Forest	National Forest Lands			(Non-NF Lands)			Total NF (NF+pvt)
	Pairs	Territorial Singles	Singles	Pairs	Territorial Singles	Singles	

		Singles			Singles		
Eldorado	160	36	13	12	5	5	209 (231)
Inyo	1	1	1	0	0	0	3 (3)
Lassen	99	18	20	6	0	2	137 (145)
Modoc	1	0	0	0	0	0	1 (1)
Plumas	171	53	31	8	2	4	255 (269)
Sequoia	72	44	17	6	1	1	133 (141)
Sierra	141	31	45	9	3	3	217 (232)
Stanislaus	113	52	30	20	6	6	195 (227)
Tahoe	107	26	24	17	4	8	157 (186)
Lake Tahoe Basin	8	0	4	1	1	0	12 (13)
Humboldt-Toiyabe*	4	0	0	0	0	0	4 (4)
Total	**873**	**185**	**261**	**73**	**36**	**26**	**1323 (1452)**

**data supplied by forest in 1999*

These numbers represent an incomplete count of the California spotted owl population because not all areas have been surveyed and survey results, particularly on industrial forest lands, have not always been reported to the Department of Fish and Game (Gould 1999, pers comm.). Forest Service biologists estimate an additional 160 to 218 sites (singles and pairs) on National Forest System lands in the Sierra Nevada based on unsurveyed suitable habitat. The number of nonterritorial adults (floaters) in the population remains unknown.

Estimates of mean crude density reported by Noon et al. (1992) from four study areas in the Sierra Nevada ranged from 0.526 owls per square mile on the Sierra National Forest to 0.259 owls per square mile on the Eldorado National Forest. Subsequent research has demonstrated that estimates of mean crude density varied annually during 1990-1998, ranging between 0.313-0.530 owls per square mile on the Sierra National Forest and 0.415-0.615 in Sequoia National Park (Steger et al. 1998). Density may not be an indicator of habitat quality sensu Van Horne (1987).

Estimates of California spotted owl population trends are available from demographic studies conducted at four study areas across the range of the owl in the Sierra Nevada (Lassen NF, Eldorado NF, Sierra NF, Sequoia/Kings Canyon National Park). All four studies reported statistically significant declining trends over the duration of each study based on estimates of lambda, the finite rate of annual population change (Blakesley and Noon 1999, Gutiérrez et al. 1999, Steger et al. 1999). These estimates suggest rates of decline during the periods of study that range from 6 to 11 percent per year.

Estimates of the finite rate of annual population change (lambda) from four California spotted owl demographic studies conducted in the Sierra Nevada, 1986-1998. Overall change is computed by extrapolating lambda over the period of study.

Study Area	Years	Lambda	95 percent C.I.	S.E.	Overall change*
Lassen NF	1990-1998	0.923	0.888-0.958	-	-51.4 percent
Eldorado NF	1986-1998	0.930	-	0.027	-61.1 percent
Sierra NF	1987-1998	0.898	-	-	-72.5 percent
Sequoia NP	1988-1998	0.940	-	-	-49.4 percent

Most or all researchers studying the demography of California spotted owls agree that populations are declining, but uncertainty exists as to whether the declines are as steep as lambda indicates (Verner 1999). Lambda estimates may overstate the rate of decline in California spotted owls due to several reasons (Noon et al. 1992, Raphael et al. 1996, Franklin et al. 1999, FEIS), including overestimates of mortality. The mark-recapture models used to estimate vital rates cannot distinguish between owls that die and owls that permanently leave the area and survive elsewhere, which can lead to overestimates of mortality. Recognizing this, researchers often calculate the emigration rates that would be necessary in a stable population to reproduce the estimated mortality rates (e.g., Burnham et al. 1996, Blakesley and Noon 1999). Even allowing for reasonable estimates of emigration, the demographic projections suggest declining populations. Declining trends of California spotted owls suggested by demographic models are generally corroborated by declines in occupied sites (Gordon Gould, California Department of Fish and Game, pers. comm., 2000). For example, census data from the Sierra NF and the Sequoia NF (Steger et al. 1999) indicated an annual rate of decline of 5.3 percent and Gutiérrez et al. (2000) report that there were noticeably fewer territorial individuals encountered on the density area of their study in 1999 than during the previous seven years. They suggest that, although more study is required to confirm if this drop in territorial owls was due to mortality or detectability, the apparent decline in territorial holders increases concerns about the health of this population.

Climate may influence vital rates of spotted owls through direct and indirect means (LaHaye et al. 1994, Verner 1999, Franklin et al. (2000), North et al. (2000), such as its effect on prey populations. In southern California, drought was hypothesized to affect spotted owl population dynamics through its effect on prey (LaHaye et al. 1994). North et al. (2000) found synchronous low reproductive success of owls in the Sierra National Forest and Sequoia/Kings Canyon National Park correlated to high spring precipitation (as found for northern spotted owls by Franklin et al. 2000) and lower spring temperatures, presumably due to effects of weather on prey species. Results of a modeling study conducted by Franklin et al. (2000) suggested that northern spotted owl populations may experience periods of decline solely to climatic variation; i.e., even if habitat conditions remain unchanged, northern spotted owl populations may decline. The synchronous declines in reproduction observed by North et al. (2000) are of concern because as populations decline, the effects of catastrophes, especially those having a synchronous effect on populations, will have an increasing importance in determining rates of population change (Peery 1999, Franklin et al. 2000).

Studies by Franklin et al. (2000) for northern spotted owls and by North et al. (2000) for California spotted owls indicate the important role habitat may play in buffering against the negative effects of climate. Franklin et al. found the best model for adult survival supported interactions between climate and habitat. Habitat quality, as defined by an optimal mix of edge and interior habitat, appeared to buffer the effects of climatic variation on survival, presumably because such habitats provided sufficient prey resources. North et al. found that the characteristics of nest site structures can modify microclimate conditions. Despite synchronous low reproduction, certain nests consistently exhibited higher reproductive success. In oak woodlands, these nests were on shrubby, north-aspect slopes in trees or snags surrounded by a well-developed canopy and in conifer forests they were overtopped by a canopy with a high foliage volume. The authors concluded that reproduction is influenced by both regional weather conditions and nest-site canopy structure, which protects fledglings from detrimental weather.

According to the FEIS, forest ecologists estimate that old forest conditions have declined from 50 to 90 percent compared to the range of historical conditions. Beardsley et al. 1999 estimated that approximately 15 percent of coniferous forests in the Sierra Nevada remain in old growth (Beardsley et al. 1999) or high quality old growth/late successional stands (stands making high contributions to late-successional forest functions and the best remaining examples of old-growth forests), most of which are in high elevations and national parks (Franklin and Fites-Kaufmann 1996). Timber harvest for over a century has resulted in reduced number of large trees, snags, and downed logs (Verner et al. 1992a, Franklin and Fites-Kaufmann 1996), attributes used or selected by California spotted owls. Low elevations and accessible areas (McKelvey and Johnston 1992, Beardsley et al.1999) and commercially important forest types such as west-side mixed conifer and east-side pine (Franklin and Fites-Kaufmann 1996) have been the most impacted.

Most of the remaining high quality late successional/old growth habitat in the Sierra Nevada is in public ownership; less than two percent of 121,500 ha (3 million acres) of private land was classified as high quality late successional/old growth habitat (Franklin and Fites-Kaufmann 1996). Franklin and Fites-Kaufmann (1996) and Beardsley et al. (1999) found most of the old growth remaining in national forests in the Sierra Nevada is in areas available for timber harvest. Bias and Gutiérrez (1992) attributed low use of private timberlands by roosting and nesting California spotted owls to sanitation and high-grade logging that removed potential nest trees. California spotted owls, however, have been known to use selectively harvested stands, although the quantity of suitable habitat required is unknown (Zabel et al. 1992b). Where forests in the Sierra National Forest were heavily thinned, owls consistently nested in patches with large, old, high crown-volume trees (North et al. 2000). Habitat loss on public and private lands has prompted spotted owl biologists to advocate conservative management to retain or restore

California spotted owl habitat (Bias and Gutiérrez 1992, Gutiérrez et al. 1992, Blakesley and Noon 1999).

Several authors have observed that unlike forests of the Pacific Northwest, forests of the Sierra Nevada have not been fragmented by timber harvest (Franklin and Fites-Kaufmann 1996, North et al. 2000). This is primarily because selection timber harvest has been the dominant type of silviculture in the Sierra Nevada. As a result, timber harvest has not created high contrast fragmentation between forested and non-forested areas, but a low contrast gradient of habitats (Verner et al. 1992a, Franklin and Fites-Kaufmann 1996). Although forest continuity in the Sierra Nevada is high, the forest structure has been greatly simplified relative to presettlement conditions (Franklin and Fites-Kaufmann 1996).

Timber harvest, in conjunction with fire suppression, has changed the structure of Sierra Nevada forests from one dominated by large, old, widely-spaced trees to one characterized by dense, fairly even-aged stands in which the larger trees are 80-100 years old (McKelvey and Johnston 1992). The species composition of these forests has also changed from shade intolerant, fire-hardy species such as ponderosa pine and black oaks to shade intolerant, fire sensitive species such as white fir and incense-cedar (Verner et al. 1992b, Weatherspoon et al. 1992). Similar increases in density and changes in species composition were documented for coniferous forests of the San Bernardino Mountains (Minnich et al. 1995). As a result, these forests are prone to large, catastrophic fires (Verner et al. 1992a). Verner et al. (1992a) identified the following major factors of concern in habitats of California spotted owls in the Sierra Nevada that pertained to fire risk: (1) ingrowth of shade-tolerant tree species, creating unnaturally dense stands with ground-to-crown fuel ladders; (2) excessive accumulation of surface fuels; and (3) change in composition of tree species from fewer pines and black oaks to more firs and incense-cedar.

Twentieth century fire records from the Sierra Nevada show that fire risk is inversely related to elevation (McKelvey and Busse 1996). Approximately 39 percent of the known owl sites on national forest lands in the Sierra Nevada occur in areas of high fire hazard risk. These high fire hazard risk sites include 38 percent of the known national forest pairs, 44 percent of the territorial singles, and 36 percent of the single birds. Weatherspoon et al. (1992) characterized forests selected by spotted owls as having the structural components for crown fires. Because fire suppression has increased density of stands in the Sierra Nevada, it is possible it has led to net improvement in owl habitat in some areas (Weatherspoon et al. 1992) with resultant increases in spotted owls (Verner et al. 1992a). However, the known number of California spotted owl sites burned in recent wildfires is low. From 1993 through 1998, only 15 California spotted owl protected activity centers (PACs) or spotted owl habitat areas (SOHAs) burned in wildfires. (Three of the 15 are known to remain occupied.). This represents an annual rate of loss of about 0.2 percent of the PACs and SOHAs on national forests in the Sierra Nevada over a 6-year period. This possibly is because the success of initial attack on wildfires is greater in owl habitat in Sierran mixed conifer types (Weatherspoon et al. 1992) or because California spotted owls often occupy relatively moist areas such northern aspects (Gould 1977, Barrows 1981, Gutiérrez et al. 1992, North et al. 2000), lower slopes of canyons (Gould 1977, Gutiérrez et al. 1992), or areas close to water (Gould 1977) where average fire intervals are longer (Weatherspoon et al. 1992). The risk of catastrophic fire strongly influenced the choice of interim guidelines recommended by Verner et al. (1992a). To reduce the risk of catastrophic loss of California spotted owl habitat to wildfire, Weatherspoon et al. (1992) proposed making prescribed burning a priority in PACs or suitable nesting and roosting habitat where timber harvest would not occur.

Distribution of known California spotted owl sites by reproductive status and fire hazard risk rating.

	Fire Hazard Risk Rating (Hazard Class)			
Reproductive Status	**Low (3& 4)**	**Moderate (5 & 6)**	**High (7-9)**	Total
Pairs	137	409	333	879
Territorial Singles	40	107	115	262
Singles	38	84	74	196
Total	**215**	**600**	**522**	**1337**

Beck and Gould (1992) described five conditions which give rise to some concern for the integrity of the California spotted owl's range in the Sierra Nevada (1) bottlenecks in distribution of habitat or owl populations; (2) gaps in the known distribution of owls; (3) locally isolated populations; (4) highly fragmented habitat; and (5) areas of low crude density of spotted owls. Eight areas in the Sierra Nevada were identified in the Technical Report as areas where one or more of these conditions currently limit the owl population. These areas of concern were thought to indicate potential areas where future problems may be greatest if the owl's status in the Sierra Nevada were to deteriorate. They represent areas where management decisions may have a disproportionate potential to affect the California spotted owl population. Of particular concern are areas of checkerboard ownership and large inclusions of non-federal lands which occur on the Tahoe, Eldorado, and Stanislaus national forests. Habitat projections in areas of checkerboard ownership are highly uncertain and the existing condition is often highly fragmented. In addition, the petitioners identified areas of concern at the southern end of the Sierra National Forest near the Kings River Canyon, where an almost complete east to west gap in owl distribution occurs, and an area in Sequoia National Park where the distribution of owl habitat is narrow.geographic area of concern.

Area of Concern	Reason for Concern	Number of owl activity centers by fuels management zone			
		Urban core defense zone	Urban threat zone	Total inside Urban zones	Total Outside urban zone
AOC 1 (LNF)	Habitat discontinuous, naturally fragmented and poor quality due to drier conditions and soils	0	1 (3 percent)	1 (3 percent)	34 (96 percent)
AOC 2 (LNF)	Gap in known distribution, mainly on private lands, extends east-west almost fully across the width of the owl's range	0	4 (13 percent)	4 (13 percent)	26 (87 percent)
AOC 3 (TNF)	An area of checkerboard lands; dominated by granite outcrops and red fir forests; both features guarantee low owl densities	3 (6 percent)	13 (26 percent)	16 (32 percent)	33 (68 percent)
AOC 4 (ENF)	Checkerboard lands and large, private inholdings; owl densities unknown on some private lands and very low on others	2 (3 percent)	13 (22 percent)	15 (25 percent)	44 (75 percent)
AOC 5 (STNF)	Has large private inholdings; owl densities unknown on most private lands.	2 (14 percent)	8 (57 percent)	10 (71 percent)	4 (29 percent)
AOC 6 (STNF)	Burned in recent years; the little remaining habitat is highly fragmented	1 (4 percent)	3 (11 percent)	4 (15 percent)	23 (85 percent)
AOC 7 (SNF)	Habitat naturally fragmented due partly to low elevations and dry conditions; accentuated by logging	2 (22 percent)	5 (55 percent)	7 (78 percent)	2 (22 percent)
AOC 8 (SQNF)	Small, isolated populations at the south end of the Sierra Nevada that are more vulnerable to extinction by local stochastic events	1 (4 percent)	5 (22 percent)	6 (26 percent)	17 (74 percent)
Total inside AOCs		11 (5 percent)	52 (21 percent)	63 (26 percent)	183 (74 percent)
Outside AOC's		45 (4 percent)	341 (32 percent)	386 (36 percent)	683 (64 percent)
Total		**56 (4 percent)**	**393 (30 percent)**	**449 (34 percent)**	**866 (66 percent)**

Although the FEIS states current distribution and abundance of owls in the Sierra Nevada does not suggest that habitat has markedly declined in abundance within any forest type, fifty percent of owl sites in the Sierra Nevada (58 percent in the central Sierra Nevada) have less than 60 percent of their home range in moderate and dense canopied forest (approximated as CWHR classes 6, 5D, 5M, 4D, and 4M) indicating potentially lower productivity for these sites according to the work of Hunsaker et al. (*in press*). According to the DEIS, habitat associated with these owl sites may be insufficient to support a self-sustaining population of owls. Fifty-eight percent of owl sites in the Central Sierra Nevada (represented as the Plumas, Tahoe, Eldorado, and Stanislaus national forests) have less than 60 percent of their home range in moderate and dense canopied forest, whereas 32 percent of owl sites in the southern Sierra Nevada (Sierra and Sequoia national forests) have less than 60 percent of their home range in moderate and dense canopied stands. This analysis assumes private lands do not contribute to the proportion of moderate and dense canopied habitat within home ranges, because the future status of that habitat remains uncertain.

According to data provided to the U.S. Fish and Wildlife Service by the Forest Service, approximately 4 million acres of suitable owl habitat in CWHR classes 6, 5D, 5M, 4D, and 4M are in the seven national forests in which 99 percent of the known owl sites occur, there is. Of this, approximately 25 percent is 4M and 25 percent is 4D. The percentage of 4M and 4D stands in QLG forests (Lassen, Plumas, and Tahoe) have greater than the average 50 percent of 4M and 4D stands, with 88, 72, and 58 percent, respectively.

Acres of spotted owl habitat in CWHR classes 6, 5D, 5M, 4D, and 4M (U.S. Forest Service data).

	WHRLABEL					
FOREST	4D	4M	5D	5M	6	Grand Total
Eldorado	74313.90449	27046.99381	15774.02153	43753.29453	186728.4938	347616.7081
Lassen	269681.1036	381901.9869			81627.80374	733210.8943
Plumas	364505.3726	185142.3737		19195.12143	187885.1693	756728.0371
Sequoia	84602.33479	115042.4067	504.3915074	148723.2164	186551.2451	535423.5945
Sierra	40260.80589	129273.6752	32.24725246	289027.2311	193216.6409	651810.6004
Stanislaus	27921.89513	42144.71262	0.444789689	149613.4629	248435.0569	468115.5724
Tahoe	158925.5799	129410.8929	2.668738135	3.780712357	213147.8893	501490.8115
Grand Total	1020210.996	1009963.042	16313.77382	650316.1071	1297592.299	3994396.218

Status of the Species

Southwestern willow flycatcher

The southwestern willow flycatcher was federally-listed as endangered on February 27, 1995 (60 FR 10694). Critical habitat for this subspecies was designated on July 2, 1997 (62 FR 39129). A recovery plan has not been adopted for this species.

The southwestern willow flycatcher is a small, insectivorous (passerine) songbird, approximately 15 centimeters (5.75 inches) in length. Both sexes of southwestern willow flycatchers have grayish-green back and wings, whitish throats, light gray-olive breasts, and pale, yellowish bellies. The song is a sneezy “fitz-bew” or “fitz-a-bew” and the typical call is a breathy “whit” (e.g., Unitt 1987).

This flycatcher is a recognized subspecies of the willow flycatcher (*Empidonax traillii*). Although previously considered conspecific with the alder flycatcher (*Empidonax alnorum*), the willow flycatcher is distinguishable from that species by morphology (Aldrich 1951), song type, habitat use, structure, and placement of nests (Aldrich 1953), eggs (Walkinshaw 1966), ecological separation (Barlow and MacGillivray 1983), and genetic distinctness (Seutin and Simon 1988). In turn, the southwestern willow flycatcher is one of five subspecies of the willow flycatcher currently recognized (Hubbard 1987, Unitt 1987, Browning 1993). The willow flycatcher subspecies are distinguished primarily by differences in color and morphology. Unitt (1987) and Browning (1993) concluded that the southwestern willow flycatcher is paler than other willow flycatcher subspecies. Preliminary data also suggest that the song dialect of the southwestern willow flycatcher is distinguishable from other willow flycatchers.

The current breeding range of the southwestern willow flycatcher includes southern California, southern Nevada, Arizona, New Mexico, and western Texas (Hubbard 1987, Unitt 1987, Browning 1993). This subspecies may also breed in southwestern Colorado, but nesting records are lacking. Records of breeding in Mexico are few and confined to extreme northern Baja California and Sonora (Unitt 1987, Howell and Webb 1995). The migration routes of this subspecies are not well understood, however it is known to winter in Mexico, Central America, and northern South America (Phillips 1948, Ridgely 1981, Stiles and Skutch 1989, Ridgely and Tudor 1994, Howell and Webb 1995).

All three resident subspecies of the willow flycatcher (*E. t. extimus*, *E. t. brewsteri*, and *E. t. adastus*) were once considered widely distributed and common within California wherever suitable habitat existed (Grinnell and Miller 1944). The historic range of southwestern subspecies in California apparently included all lowland riparian areas of the southern third of the state and likely included the willow “stringer” habitats in the lower elevations of the Inyo, Sierra and Sequoia Forests (Grinnell and Miller 1944). Nest and egg collections indicate the bird was a common breeder along the lower Colorado River near Yuma in 1902 (T. Huels, University of Arizona, in litt.). Willett (1933) considered the bird to be a common breeder in coastal southern California.

The southwestern willow flycatcher is a neotropical migrant that nests in riparian woodlands and associated wet areas, typically where there are mature, dense stands of willows (*Salix* spp.), cottonwoods (*Populus* spp.), or alders (*Alnus* spp.). Riparian habitat provides both breeding and foraging habitat for the species. The Kern River Valley population nests and forages in riparian forest habitat along the South Fork of the Kern River, where dense growths of willows and cottonwoods are the dominant species.

This flycatcher nests in thickets of trees and shrubs approximately 4 to 7 meters (13 to 23 feet) or more in height with dense foliage from approximately 0 to 4 meters (0 to 13 feet) above ground. On the South Fork of the Kern, it has been documented nesting as high as 16 meters in trees up to 20-24 meters high (Whitfield and Enos 1998). The nest site plant community is typically even-aged, structurally homogeneous, and dense (Brown 1988, Sedgewick and Knopf 1992). Nesting sites are usually near or over standing water (Sogge et al. 1997). Water is not necessarily present at the latter stages of the breeding cycle, but it is always available during early stages of breeding and pair formation. At some nest sites surface water may be present early in the breeding season, but only damp soil may be present by late June or early July (60 FR 10694). This species usually nests in the upright fork of a shrub, but occasionally nests on horizontal limbs within trees and shrubs (Terres 1980). Migrating willow flycatchers use habitats similar to breeding flycatchers, but will also use desert washes, oases, and open canyon woodlands near watercourses (Small 1994).

Critical Habitat. Eighteen 18 critical habitat units, totaling 964 river kilometers (599 miles), have been designated across three states -- Arizona, California, and New Mexico (62 FR 39129). The South Fork of the Kern River and areas around Lake Isabella, including portions of the Sequoia National Forest, are designated as critical habitat.

The primary constituent elements of critical habitat for the southwestern willow flycatcher include (1) dense thickets of riparian shrubs and trees (native and exotic species), (2) areas within the 100-year floodplain where dense riparian vegetation is not present, but may become established in the future, and (3) vegetation structure ranging from 3 meters (9 feet) in height and lacking a distinct overstory to complex patches with multiple strata and canopies nearing 18 meters (60 feet) in height.

The southwestern willow flycatcher is a diurnally active species that begins singing at a predawn hour while within the territory (San Diego Natural History Museum 1995). This flycatcher is an insectivore that forages by either aerially gleaning insects from trees, shrubs, and herbaceous vegetation or hawking larger insects by waiting on exposed forage perches and capturing insects in flight (Ettinger and King 1980, Sanders and Flett 1989). Hymenopterans and Dipterans make up a majority of the diet; berries and seeds are occasionally consumed (Bent 1942).

Southwestern willow flycatchers typically arrive in the South Fork of the Kern River Valley in May of each year. The breeding season runs between May and late August, until the birds leave their summer grounds for southern destinations in early September. Research in Arizona indicates that 13-17 percent of adults move to new breeding sites each year (Paxton 2000). Between 1997 and 1998, 19 between-site movements with a median distance of 9 miles were documented for southwestern willow flycatcher. Four of these records represent between-drainage movements (Netter et al. 1998). In the 2000 breeding season, birds were found up to 186 miles from where they had been located the previous year (E. Paxton pers. comm.). Paxton (2000) reports that "areas with multiple breeding sites that are geographically close have the highest degree of between-site movement, with longer distance dispersal fairly rare. Thus, the frequency of movement is negatively correlated with distance moved."

Southwestern willow flycatchers typically raise one brood per year (USFWS 1995). The clutch size ranges from two to five; the average clutch size is 3.4 eggs in coastal southern California. This subspecies usually has a monogamous mating system within one nesting season although not all territorial males are mated (San Diego Natural History Museum 1995). Fledglings leave the nest at age 12-15 days in early July (USFWS 1995) and usually disperse from the natal territory at age 26-30 days. About 25 percent of adults return to their territory from the previous year and at least 20 percent of juveniles return to the natal area which is usually two to four kilometers from the natal territory.

Once considered widespread and common breeders in southern California including the southern portions of the Sierra Nevada, the southwestern willow flycatcher has declined precipitously throughout its range during the last 50 years (Unitt 1987). Current numbers remain significantly reduced from historical levels. Occupied habitats tend to be widely separated by vast expanses of unsuitable or degraded habitat (Dudek and Associates 2000). Only 450 flycatcher territories were detected in the United States in 1995, many of which consisted of unpaired males. Within the United States, only seven sites (populations) consist of 20 or more flycatchers, one of which is within the proposed action area-the South Fork of the Kern River (USFWS, unpub. data). Over the range of the species, 75 percent of the flycatcher populations contain fewer than five birds. Aside from the few moderately sized populations, the remaining populations are small and widely isolated with high percentages of unpaired males.

The major threats to this subspecies are destruction, modification, or degradation of habitat and brood parasitism by the brown-headed cowbird (*Molothrus ater*). It is estimated that 91 percent of historic riparian habitat suitable for the willow flycatcher has been lost in California. Changes in riparian plant communities have resulted in the degradation and elimination of nesting habitat for the willow flycatcher leading to reductions in the abundance of this species (USFWS 1995). Loss and modification of southwestern riparian habitats has occurred from urban and agricultural development, water diversion and impoundment, stream channelization, livestock grazing, off-road vehicle and other recreational uses, hydrological changes resulting from these and other land uses, and invasion of non-native plant and animal species.

Brood parasitism by the brown-headed cowbird has been documented as greatly affecting the nesting success of willow flycatchers. Cowbird parasitism results in reduction or elimination of reproduction. Brood parasitism of the willow flycatcher by brown-headed cowbirds is well documented (Rowley 1930, King 1954, Holcomb 1972, Garrett and Dunn 1981, Harris et al., Brown 1988 and 1991, Sedgewick and Knopf 1988, Whitfield 1990, Harris 1991). The introduction of modern human settlements, livestock grazing, and other agricultural developments, resulted in habitat fragmentation, which facilitates cowbird parasitism. Simultaneously, livestock grazing, and other agricultural developments served as vectors for cowbirds, providing feeding areas in or near host species' nesting habitats (Hanna 1928, Mayfield 1977).

Environmental Baseline

Southwestern willow flycatcher

Two southwestern willow flycatcher populations are documented within or near the action area – on the South Fork of the Kern River (Kern County) and along the Owens River near Bishop (Inyo County). As of 1999, there were 23 confirmed pairs on the South Fork Kern River and 12 confirmed territories (number of pairs unknown) on the Owens River (USFS Biological Assessment). None of the Owens River territories are located on National Forest System lands. In addition, it is assumed with the recovery of this species and improved riparian management as outlined in the proposed action, suitable habitats within the historic range (IE., lower elevation riparian in the southern Sierra Nevada) could become occupied by the willow flycatcher within the life of the proposed action.

On the Kern River, 5-10 pairs typically breed each year within the Sequoia National Forest's South Fork Wildlife Area near Lake Isabella (M. Whitfield; pers. comm.). Since 1989, the total number of southwestern willow flycatchers documented for the South Fork of the Kern River population has ranged between 23-44 pairs. The majority of nesting records have been on the Kern River Preserve, upstream of the South Fork Wildlife Area because water management by the Army Corps of Engineers inundates the Wildlife Area on an intermittent basis and researchers at the Kern River Preserve focus their survey efforts on the Preserve.

The only known occupied breeding habitat on National Forest System lands is within the South Fork Wildlife Area. However, there are other areas where potential suitable habitat exists, including areas west of Patterson Lane within the Isabella Reservoir "pool", the Tillie Creek area, lower elevations of the North Fork of the Kern River, lower elevations of the South Fork of the Kern River as it turns north towards the Domeland Wilderness and the Hanning Flat area. There are no records of willow flycatchers nesting in any of these areas. They are considered to be potentially suitable in terms of breeding habitat (Whitfield and Laymon, pers. comm). In 1992, a pair of willow flycatchers was documented displaying nesting behavior in the areas west of Patterson Lane. Also in 1992, a singing male was recorded utilizing areas in the Tillie Creek vicinity. All of these and other low elevation riparian areas that currently provide or could provide suitable habitat for the willow flycatcher with improved management, are within the proposed action area.

The primary land use activities occurring on National Forest lands in the South Fork of the Kern/Lake Isabella area are dispersed recreation and livestock grazing. Recreational activities include hiking, camping, fishing, boating, waterskiing, jet skiing, and swimming.

The Lake Isabella Grazing Allotment is on the southeast side of Lake Isabella, adjacent to the South Fork Wildlife Area. The 1,200 acre wildlife area is fenced to exclude livestock from the area. The grazing allotment is approximately 2,650 acres in size, depending upon the lake level. During drought years, when water storage at the lake is low, most of the area is available for grazing. When the lake is at capacity, the entire allotment is flooded. However, during the time of the year when most of the grazing occurs, the lake is drawn down to accommodate storage for the spring run-off. Water levels in the lake are controlled, with flowage/flooding easements by the Army Corps of Engineers (Corps) and thus is outside the Forest Service's jurisdiction. In addition, the Corps was issued a non-jeopardy biological opinion by this office that addressed the effects of the operation of the reservoir.

During the seven-year drought ending in 1994 the lake level was generally below 2,560' elevation year-long. The lower lake level allowed some willow/riparian habitat to become established at the lower levels of the allotment within the estuary area of the South Fork Kern River and below the South Fork Wildlife Area at 2,585'. In a normal year, the water line is above the willow habitat during the late spring, summer period. The past five years (1995-2000) of above average water storage has eliminated most willows and understory. Based upon the Sierra snow pack levels, the predicted lake level for 2000 was 330,000 acre/feet or approximately 2,585'. This translates to 80-85 percent of the Lake Isabella allotment being flooded.

During periods of low water, the area is exposed and is colonized by non-native annual grasses and forbs. The repeated cycle of inundations and exposure of the lake bottom precludes formation of any significant perennial plant cover except for Bermuda grass. Prominent annual species found on the exposed reservoir lands include red-stem filaree (Erodium cicutarium), red brome grass (Bromus rubens), and curly dock (Rumex crispus). Height and density of understory vegetation varies considerably from year to year depending on season variation in moisture, temperature and amount of inundation from rising reservoir levels.

There are indications that extended periods of inundation adversely affects suitable and potentially suitable habitat when Lake levels are above 240,000 acre feet. This is particularly true for habitat west of Patterson Lane, in the South Fork arm of Lake Isabella (Lake Isabella allotment). The past years of drought have allowed potentially suitable habitat to become established, but recent inundation by rising Lake levels has removed this habitat. Because the length of time of inundation of these willows varies, it is not practical to consider their habitat value as stable. However, on a low water year the willows on both allotments could potentially support one or more pair of willow flycatchers.

Status of the Species

Sierra Nevada Bighorn Sheep

The Sierra Nevada bighorn sheep (*Ovis canadensis californiana*) was listed as endangered by the U.S. Department of the Interior on January 3, 2000 (65 FR 1), and by the State of California under the California Endangered Species Act on March 4, 1999. Critical habitat has not yet been proposed. A recovery team has been appointed by the Director of the CDFG and it is currently completing a draft document. The following information is extracted and edited from the final listing rule and the conservation strategy upon which the recovery plan is being developed.

The bighorn sheep (*Ovis canadensis*) is a large mammal of the family Bovidae. Recent analyses of bighorn sheep genetics and morphometrics (e.g., size and shape of body parts)indicate reevaluation of the taxonomy of Sierra Nevada bighorn sheep is necessary (Ramey 1991, 1993, 1995; Wehausen and Ramey 1993, 2000). This research supports taxonomic distinction of the Sierra Nevada bighorn sheep relative to bighorn sheep in nearby regions. Nevertheless, the listing of the Sierra Nevada bighorn sheep as endangered on January 3, 2000 (65 FR 1), designated the species as a distinct population segment. The Sierra Nevada bighorn sheep population is biologically and ecologically significant to the species in that it constitutes the only population of California bighorn sheep inhabiting the Sierra Nevada. This population extends from Sonora Pass to Walker Pass, spanning approximately 215 miles of contiguous suitable habitat.

The historical range of the Sierra Nevada bighorn sheep includes the eastern slope of the Sierra Nevada and — for at least one subpopulation– a portion of the western slope, from Sonora Pass in Mono County south to Walker Pass in Kern County, a total distance of about 215 miles (Jones 1950; Wehauser 1979, 1980). By the turn of the century, about 10 subpopulations survived out of 20 originally counted. The number dropped to five subpopulations at mid-century, and down to two subpopulations in the 1970s, which existed near Mount Baxter and Mount Williamson in Inyo County (Wehauser 1979). Currently, five subpopulations of Sierra Nevada bighorn sheep occur, respectively, at Lee Vining Canyon, Wheeler Crest, Mount Baxter, Mount Williamson, and Mount Langley in Mono and Inyo Counties. Three of these subpopulations have been reintroduced using sheep obtained from the Mount Baxter subpopulation from 1979 to 1986 (Wehausen et al. 1987).

The current and historical habitat of the Sierra Nevada bighorn sheep is almost entirely on public land managed by the USFS, BLM, and the National Park Service. The Sierra Nevada mountain range is located along the eastern boundary of California. Peaks vary in elevation from 6000 to 8000 feet in the north to over 14,000 feet in the south adjacent to Owens Valley, and then drop rapidly in elevation in the southern extreme end of the range (Wehausen 1980). Most precipitation, in the form of snow, occurs from October through April (Wehausen 1980).

Sierra Nevada bighorn sheep inhabit the alpine and subalpine zones during the summer, using open slopes where the land is rough, rocky, sparsely vegetated, and characterized by steep slopes and canyons (Wehausen 1980; Sierra Nevada Bighorn Sheep Interagency Advisory Group 1997). Most of these sheep live between 10,000 and 14,000 feet in elevation in summer (John Wehausen, University of California, White Mountain Research Station, pers. comm. 1999). In winter, they occupy high, windswept ridges or migrate to the lower elevation sagebrush-steppe habitat as low as 4800 feet to escape deep winter snows and find more nutritious forage. Bighorn sheep tend to exhibit a preference for south-facing slopes in the winter (Wehausen 1980). Lambing areas safe from predators are located on precipitous, rocky slopes. Bighorn sheep prefer open terrain where they are better able to see the approach of predators. Consequently, they usually avoid forests and thick brush if possible (J. Wehausen, pers. comm. 1999).

Bighorn sheep have two adaptations for existence in open, rocky terrain. First is their agility on precipitous slopes, which is enables them to escape predators. Second is their keen eyesight, which is their primary sense for detecting predators. Relatively short legs and a stocky build allow agility on rocks, but preclude fleetness necessary to outrun coursing predators in less rocky terrain. Consequently, bighorn sheep select open habitats that allow detection of predators at sufficient distances to allow adequate lead time to reach the safety of precipitous terrain. In short, optimal bighorn habitat is visually open and contains steep, generally rocky, slopes. Fire can play an important role in creating suitable habitat for bighorn as well as improving predator detection in existing habitat. Large expanses lacking precipitous escape terrain, such as Owens Valley, represent substantial barriers to movement. Even within mountain ranges like the Sierra Nevada, bighorn sheep habitat is frequently patchy and the population structure is naturally fragmented (Bleich et al. 1990a). Because of relatively conservative behaviors these sheep have developed in these naturally fragmented habitat patches, bighorn sheep are slow colonizers. This has necessitated capturing and moving sheep to locations deemed suitable to speed up and assure reoccupancy of areas where they were considered extirpated as a result of human activities since the appearance of Europeans.

Bighorn sheep are primarily diurnal, and their daily activity shows some predictable patterns that consist of feeding and resting periods (Jones 1950). Bighorn sheep are primarily grazers; however, they may browse woody vegetation when it is growing and very nutritious. They are opportunistic feeders selecting the most nutritious diet from what is available. Plants consumed include varying mixtures of grasses, browse (shoots, twigs, and leaves of trees and shrubs), and herbaceous plants, depending on season and location (Wehausen 1980). In a study of the Mount Baxter and Mount Williamson subpopulations, Wehausen (1980) found that grass, mainly perennial needlegrass (*Stipa speciosa*), is the primary diet item in winter. As spring green-up progresses, the bighorn sheep shift from grass to a more varied browse diet, which includes Mormon tea (*Ephedra viridis*), California buckwheat (*Eriogonum fasciculatum*), and bitterbrush (*Purshia* spp.).

Sierra Nevada bighorn sheep are gregarious, with group size and composition varying with gender and from season to season. Spatial segregation of males and females occurs outside the mating season, with males more than two years old living apart from females and younger males for most of the year (Jones 1950; Cowan and Geist 1971; Wehausen 1980). Ewes generally remain in the same band into which they were born (Cowan and Geist 1971). During the winter, Sierra Nevada bighorn sheep concentrate in those areas suitable for wintering, preferably Great Basin habitat (sagebrush-steppe) at the very base of the eastern escarpment. Subpopulation size can number more than 100 sheep, including rams (this was observed at a time when the population size was larger than it is currently) (J. Wehausen, pers. comm. 1999). Breeding takes place in the fall, generally in November (Cowan and Geist 1971). Single births are the norm for North American wild sheep, but twinning is known to occur (Wehausen 1980). Gestation is about 6 months (Cowan and Geist 1971).

Lambing occurs between late April and early July, with most lambs born in May or June (Wehausen 1980, 1996). Ewes with newborn lambs live solitarily for a short period before joining nursery groups that average about six sheep. Ewes and lambs frequently occupy steep terrain that provides a diversity of slopes and exposures for escape cover. Lambs are precocious and, within a day or so, climb almost as well as the ewes. Lambs are able to eat vegetation within two weeks of their birth and are weaned between one and seven months of age. By their second spring, they are independent of their mothers. Female lambs stay with ewes indefinitely and may attain sexual maturity during the second year of life. Male lambs, depending upon physical condition, may also attain sexual maturity during the second year of life (Cowan and Geist 1971).

Average lifespan is nine to 11 years in both sexes, though some rams are known to have lived to 12 to 14 years old (Cowan and Geist 1971; Wehausen 1980).

Environmental Baseline

Sierra Nevada bighorn sheep

Historically, Sierra Nevada bighorn sheep populations occurred along and east of the Sierra Nevada crest from Sonora Pass (Mono County) south to Walker Pass (Olancha Peak) (Kern County) (Jones 1950, Wehausen 1979). Sheep apparently occurred wherever appropriate rocky terrain and winter range existed. With some exceptions, most of the populations wintered on the east side of the Sierra Nevada and spent summers near the crest (Wehausen 1979).

Numbers of subpopulations of Sierra Nevada bighorn sheep probably began declining with the influx of gold miners to the Sierra Nevada in the mid-1880s, and those losses have continued through the 1900s (Wehausen 1988). By the 1970s, only two subpopulations of Sierra Nevada bighorn sheep, those near Mount Baxter and Mount Williamson in Inyo County, are known to have survived (Wehausen 1979). Disease is believed to be the factor most responsible for the disappearance of bighorn subpopulations in the Sierra Nevada. Jones (1950) suggested that scabies was responsible for a die-off in the 1870s on the Great Western Divide. Experiments have confirmed that bacterial pneumonia (teurellaecies), carried normally by domestic sheep, can be fatal to bighorn sheep (Foreyt and Jessup 1982).

By 1979, only 220 sheep were known to exist in the Mount Baxter subpopulation, and 30 in the Mount Williamson subpopulation (Wehausen 1979). Sheep were obtained from the Mount Baxter subpopulation and transplanted to three historically occupied locations, which were Lee Vining Canyon, Wheeler Crest, and Mount Langley (Wehausen 1996; Sierra Nevada Bighorn Sheep Interagency Advisory Group 1997). Consequently, Sierra Nevada bighorn sheep now occur in five subpopulations in Mono and Inyo Counties: at Lee Vining Canyon, Wheeler Crest, Mount Baxter, Mount Williamson, and Mount Langley. The Sierra Nevada bighorn sheep population reached a high of about 310 in 1985-86, but subsequent population surveys have documented a declining trend (J. Wehausen, pers. comm. 1999). As of 1999, the total Sierra Nevada bighorn sheep population was estimated to be between 117 and 129 adult animals (J. Wehausen, pers. comm. 2000) (Table 1). The continuing decline of the Sierra Nevada bighorn sheep has been attributed to a combination of the direct and indirect effects of predation (Wehausen 1996).

Table 1. Sierra Nevada Bighorn Sheep Population Numbers, by Year (J.Wehausen, Pers. Comm. 1999)

Year	Number of populations	Total sheep
1978	2	250
1985	4	310
1995	5	100
1996	5	110
1997	5	130
1998	5	100
1999	5	125*

*Note that the difference in population size between 1998 and 1999 is based on (1) a small band of bighorn sheep were located in Sand Mountain (Mount Baxter subpopulation), and (2) approximately 15 lambs were born to the Wheeler Crest subpopulation in 1999.

Data from counts of females, yearlings, and ewes in 2000 indicate that the population has increased, most likely due to a very high survivorship of 1999 lambs and adults. The number of lambs documented in summer 2000 is 54 percent higher than a year ago.

The primary threats to Sierra Nevada bighorn sheep are believed to be direct and indirect effects of predation from mountain lions, risk of disease from domestic sheep, and environmental catastrophes. Bighorn sheep are more vulnerable to environmental effects when they avoid lower-elevation winter range. Mountain lion predation on the Sierra Nevada bighorn sheep during the late 1980s and early 1990s became a limiting factor for the continued survival of the sheep. The decline of Sierra Nevada bighorn sheep is attributed to mountain lions which impact bighorn sheep both directly and indirectly. Direct predation in the late 1980s increased throughout the bighorn's range, and continued into the 1990s.

Mountain lions are thought to affect Sierra Nevada bighorn sheep indirectly when the sheep abandon lower elevation winter range apparently to avoid predation. When groups of bighorn sheep avoid moving into lower elevation wintering range, they are adversely affected by the harsh conditions and poor forage available at the higher elevations; they emerge from winter in poorer condition and with less recruitment in the population. Wehausen (1996) cites habitat abandonment as having the potential to lead to extirpation of some bighorn sheep populations. Bighorn sheep are much more susceptible to catastrophic winter losses when avoiding winter ranges.

Numerous diseases of bighorn sheep have been documented, but most notable are the pneumonias to which the sheep are particularly susceptible (Post 1971). Of particular management importance has been the finding that strains of respiratory bacteria carried by sheep, and occasionally goats, of Old World origin cause fatal pneumonia in bighorn sheep. The history of bighorn sheep is replete with examples of major die-offs following contact with domestic sheep (Goodson 1982). Experiments have repeatedly confirmed that bighorn sheep are not compatible with strains of respiratory bacteria carried normally by domestic sheep (Onderka and Wishart 1988, Foreyt 1989, Callan et al. 1991). It has recently been documented that domestic goats can also carry bacterial strains fatal to bighorn sheep. In addition, bighorn sheep can develop pneumonias independent of contact with domestic sheep. Lungworms of the genus *Protostrongylus* can be important contributors to this disease process in some situations (Forrester 1971, Woodard et al. 1974) and management strategies to control these parasites have been developed (Schmidt et al. 1979). Bighorn sheep in the Sierra Nevada carry *Protostronglus sp.* lungworms, but the parasite loads have been too low to be considered a management concern.

The preliminary draft recovery plan for Sierra Nevada bighorn sheep identifies large geographic recovery units. The proposed establishment of these units are based on the Recovery Team's determination that restoring the bighorn sheep to the historic areas of the species' range is essential to its survival and recovery. The status of the Sierra Nevada bighorn sheep will be considered within the smaller scale of recovery units as opposed to the overall range. The goal of the draft recovery plan is to protect the long-term viability of all extant populations within each recovery unit. The recovery tasks identified in the preliminary recovery plan are: 1) Acquire, protect, and enhance habitat; 2) Manage predators to assure recovery of existing herds and success of reintroduced herds; 3) Manage domestic livestock to prevent transmission of diseases to bighorn sheep; 4) :Manage the bighorn sheep population to assure recovery (e.g., use translocation to reintroduce sheep to unoccupied herd areas and to enhance recovery of existing herds by augmenting and maximizing retention of genetic diversity; 5) Manage human use to minimize negative impacts on bighorn sheep; 6) Monitor bighorn sheep herds; 7) Monitor predators; 8) Research; and 9) Public education and outreach.

The action area covers the entire historic range of the Sierra Nevada bighorn sheep. The current population occurs almost entirely on the Inyo National Forest.

Status of the Species

Pacific fisher

The fisher (*Martes pennanti*) has a long slender body with short legs. The fisher's head is triangular with a sharp, pronounced muzzle, forward-facing eyes, and large, rounded ears. Sexual dimorphism is pronounced with males weighing between 3.5 and 5.5 kilograms and females weighing between 2.0 and 2.5 kilograms (Powell 1993). Males range in length from 90 to 120 centimeters and females range from 75 to 95 centimeters (ibid.). The tail is long and bushy. Fishers are mostly dark brown in color. Their face, neck and shoulders are silver or light brown, contrasting with the tail, legs and rump, which are black. Their undersurface is uniformly brown, except for white or cream colored patches around the genitals and on the chest, which may be individually distinctive (Powell 1993). The fur ranges in length from 30 millimeters on the stomach and chest to 70 millimeters on the back (Powell 1993). Fishers have five toes with retractable but not sheathed claws. Their feet are large and plantigrade (the entire sole contacts ground) with four central pads and a pad on each toe. On the hindpaws, the central pads have circular patches of coarse hair that are associated with plantar glands. These glands produce a distinctive odor and are believed to be used for communication during reproduction (ibid.). Based on an examination of several skins, Grinell et al. (1937) noted that fishers from the Sierra Nevada tends to be paler in color than fishers from other parts of the United States.

A member of the family Mustelidae, the fisher is the largest member of the genus *Marte*s, which includes the yellow-throated martens, true martens and fishers. *Martes pennanti* is the only extant species of the fisher. Goldman (1935) recognized three subspecies: *Martes pennanti pennanti* (eastern and central North America), *Martes pennanti columbiana* (Rocky Mountains), and *Martes pennanti pacifica* (the "Pacific fisher" of West Coast North America). Conversely, both Grinnell et al. (1937) and Hagmeir (1959) examined specimens from across the range of the fisher without finding sufficient differences in morphology or pelage to support recognition of separate subspecies. Recent genetic analysis found patterns of population subdivision similar to the earlier described subspecies (Drew et al. in litt.). This observed variation was considered by Drew et al. to be insufficient to warrant recognition of subspecies, but sufficient to support recognition of distinct population segments. In 1991, the Service concluded that despite insufficient genetic information to determine whether subspecific status is appropriate, the Pacific fisher does represent a distinct population that interbreeds (56 **FR** 1159). The Service concluded that the Pacific fisher is a "species" in accordance with the definition of the Act (ibid.).

Fishers are opportunistic predators with a diverse diet; which includes birds, porcupines, snowshoe hares, squirrels, mice, shrews, voles, insects, deer carrion, vegetation and fruit (Martin 1994, Powell 1993, Zielinski et al. 1999). Fishers in the southern Sierra Nevada and northern California utilize substantially different prey than fishers in other parts of the country (Zielinski et al. 1999). Throughout most of its range, snowshoe hare and porcupine are important components of the fisher's diet. The southern Sierra Nevada, however, is not within the range of the snowshoe hare and the porcupine occurs only at very low densities (Zielinski et al. 1999). Both are present in northern California, but are not abundant. Although mammals were the most frequent prey found in fisher scat in southern Sierra Nevada populations, reptiles constituted a major prey item, occurring in 20.4 percent of all observed scat (Zielinski et al. 1999). Similarly, reptiles were found to be an important prey item for fishers in Northern California, but elsewhere in North America they constitute a very minor portion of the fisher's diet (less than one percent) (ibid.). Pacific fishers may feed on hypogeous fungi (false truffles) (Grenfell and Fasenfest 1979, Zielinski et al. 1999). It may be adaptive for Pacific fishers to consider many of the other species with which they occur as potential foods, possibly explaining why fishers are capable of finding, capturing, and eating so many of the species that occur in, or near, late-seral conifer forests in the Sierra Nevada (Zielinski et al. 1999). Zielinski et al. (1999) found slight variation in diet with season. In winter, their diet consists mostly of mammals, deer carrion in particular, presumably because other prey are hibernating. Fruits are eaten more commonly in autumn and winter when available. No differences were found in diet between males and females, despite significant sexual dimorphism (ibid.).

Studies of fisher foraging behavior are limited to the eastern United States (Arthur and Krohn 1991, Powell 1993, Raine 1987). It is unknown to what extent these studies can be generalized to the West Coast, where different prey is available. Based on observations of fisher tracks in the winter, Powell (1993) determined that fishers in Michigan travel in straight lines to patches of high prey density and then forage in a "zig zag" pattern, changing direction frequently. These changes in direction are not random, but rather appear to enable purposeful investigation of potential prey hiding places, such as hollow logs, piles of forest litter or root-balls (Powell 1993, Raine 1987). This behavior was most often utilized by fishers when hunting snowshoe hare, but also when hunting other small mammals (Powell 1993). Fishers rarely chase prey for long distances, instead prey are caught directly after they are flushed. They do not pounce on small mammals with their paws like canids. Prey are killed with a bite to the back of the neck or head. When killing hares, fishers sometimes wrap their body around them, holding on with their back legs (ibid.). Fishers are known to cache food. When feeding on deer carcasses, fishers may find a resting den nearby and repeatedly return to the carcass to feed. Although fishers dig holes in the snow to find prey, they exhibit far less subnivean activity than their close relative, the American marten (Raine 1987). Fishers are known to occasionally forage in trees (Powell 1993, Raine 1987). Fishers are diurnal and nocturnal, with peak activity occurring near sunset and sunrise (Arthur and Krohn 1991, Powell 1993). Activity periods typically last from two to five hours (Powell 1993). Fishers hunt in forested habitats and generally avoid openings (ibid.).

The breeding season for the fisher begins in late February and lasts until mid-April. The testes of males begin to enlarge in early March and most males produce sperm by mid-March (Frost et al. 1997, Powell 1993). Females come into estrus in early April three to nine days after parturition. Except during the breeding season, fishers are solitary animals. Beginning in March, males are more active and roam beyond the limits of their territories in search of females (Arthur and Krohn 1991, Powell 1993). Several authors noted scars on males that they believed resulted from conflict with other male fishers as territories were crossed(Leonard 1986, Powell 1993). Mate searching is likely assisted by marking of elevated objects, such as rocks and stumps, with urine, feces and musk, by both sexes (Leonard 1986, Powell 1993). Fishers are likely polygamous and may be polyandrous (Powell 1993). Courtship is often prolonged, lasting anywhere from one to seven hours, and involves tail flagging, chasing, and vocalization, mostly on the part of the female (ibid.). If the female is not receptive, she will be aggressive towards the male. Ovulation may be stimulated by copulation (Frost et al. 1997). Implantation of the blastocyst is delayed approximately ten months and may correlate with increasing photoperiod (Powell 1993). Following implantation, gestation lasts about 30 days. Parturition thus occurs nearly one year later and just prior to mating. Arthur and Krohn (1991) and Powell (1993) speculate that this system allows adults to breed in a time when it is energetically efficient, while still giving kits adequate time to develop before winter. Raised entirely by the female, kits are altricial with closed eyes and ears. By two weeks, light silver-gray hair covers the body and by 10 weeks kits wean (Powell 1993). The mother becomes increasingly active as kits grow in order to provide enough food (Arthur and Krohn 1991, Powell 1993). After about four months, the mother begins to show aggression towards kits and by one year kits will have developed their own home range (Powell 1993). Aubry et al. (in litt.) found evidence suggesting that only juvenile male fishers disperse long distances, which if true, has a direct bearing on the rate at which the fisher may be able to colonize unoccupied areas within its historic range. Fishers have a low annual reproductive capacity. Females breed at the end of their first year, but because of delayed implantation do not produce a litter until their second year. One year old males are capable of breeding, but some researchers have questioned whether they are effective breeders at this age (see Powell 1993). Litter sizes generally range from one to four, but can be as high as five or six (Powell 1993). Fishers do not always produce young every year. Truex et al. (1998) documented that, of the females in their study area in the southern Sierra Nevada, about 50 to 60 percent successfully gave birth to young. In their study area on the North Coast, however, 73 percent of females gave birth to young in 1995, but only 14 percent (one of seven) did so in 1996, indicating fisher reproductive rates may fluctuate widely.

Powell (1993) estimated the upper age limit for fishers to be 10 years. Predation and human-induced death appear to be the most important cause of mortality (Powell and Zielinski 1994, Truex et al. 1998). Truex et al. (1998) recorded 16 fisher mortalities; no cause was determined for two fatalities, nine fatalities were suspected to be from predation, and five were suspected to be human caused, including two from vehicle collisions, two cases where the collar was cut – indicating poaching, and one fatality of a fisher that became trapped in a water tank and died of exposure and/or starvation. In Yosemite National Park, four fishers were killed by automobiles between 1992 and 1998 (Chow, personal communication). Outside of California, in areas where trapping is legal, this may be a significant source of mortality. Krohn et al. (1994), for example, found that over a five year period, trapping was responsible for 94 percent of all mortality for a population of the fisher in Maine.

Fishers have large home ranges, with those of males considerably larger than those of females (Buck et al.1983, Kelly 1977, Truex et al.1998). Male home ranges in the southern Sierra Nevada average 6808 acres, while the home range of females is 1246 acres (Zielinski et al.1997). Similarly, average home ranges in northern California were 6228 acres for males and 1538 acres for females (Zielinski et al.1995). Home range size varies with quality of habitat; it is likely that fishers use larger areas in poorer quality habitat and therefore exist at lower densities (Freel 1991, Truex et al. 1998).

Fishers in the western United States are habitat specialists associated with mature and late-successional forests with an abundance of large trees, snags and logs (greater than 100 cm), conifers and oaks with broken tops and cavities, coarse woody-debris, multiple canopy layers, high canopy closure, and few openings (Aubry and Houston 1992, Buck et al. 1994, Buskirk and Powell 1994, Dark 1997, Freel 1991, Jones and Garton 1994, Powell and Zielinski 1994, Seglund 1995, Truex et al. 1998, Zielinski 1999). The fisher is among the most habitat-specific mammals in North America, and changes in the quality, quantity, and distribution of available habitat can affect their distributional range in California (Buskirk and Powell 1994). Forest type is probably not as important to fishers as the vegetative and structural aspects that lead to abundant prey populations and reduce fisher vulnerability to predation (Powell 1993). In general, fishers use forest or woodland landscape mosaics that include conifer-dominated stands, and avoid entering open areas that have no overstory or shrub cover (Buskirk and Powell 1994). They select forests that have low and closed canopies. Late-successional coniferous or mixed forests provide the most suitable fisher habitat because they provide abundant potential den sites and preferred prey species (Allen 1987).

The fisher uses habitats with similar attributes of California spotted owl habitats. However, the fisher may differ from the California spotted owl in habitat requirements as brushy vegetation can compliment the upper canopy cover resulting in a combined canopy cover suitable for fishers. Brushy vegetation for the California spotted owl does not contribute to canopy cover or suitable habitat (though it may be important prey habitat). Therefore, habitat that is not considered suitable for the California spotted owl may indeed be suitable for the fisher.

Fishers use large areas of primarily coniferous forests with fairly dense canopies and large trees, snags, and down logs. A vegetated understory and large woody debris appear important for their prey species. The following California Wildlife Habitat Relationships (CWHR) types are important to fishers: generally structure classes 4M, 4D, 5M, 5D and 6 (stands with trees 11 inches diameter at breast height or greater, and greater than 40 percent cover) in ponderosa pine, montane hardwood-conifer, mixed conifer, montane riparian, aspen, red fir, Jeffrey pine, lodgepole pine, subalpine conifer, and eastside pine (Timossi 1990). On the Sequoia National Forest, 66 percent of the average fisher home range was in 60 percent or greater canopy closure (Zielinski et al. in prep).

At a landscape scale, patches of preferred habitat and the location of open areas with respect to these patches may be critical to the distribution and abundance of fishers in an area (Buskirk and Powell 1994). Fishers will probably use patches of preferred habitat that are interconnected by other forest types, whereas they will not likely use patches of habitat that are separated by sufficiently large open areas (Buskirk and Powell 1994). Riparian corridors (Heinemeyer and Jones 1994) and forested saddles between major drainages (Buck 1983) may provide important dispersal habitat or landscape linkages (travel corridors) for the species. Riparian areas are important to fishers because they provide important rest site elements, such as broken tops, snags, and coarse woody debris (Seglund 1995).

Rest site structures used by fishers include: hollow logs; tree cavities; rocks; snags; ground burrows; fallen trees; canopy of live trees, commonly in witches brooms; and slash and brush piles (Heinemeyer and Jones 1994). In California, trees are the most commonly used rest sites. Buck (1983) reported that rest site trees were greater than 25 feet tall, with diameters of 19 to 67 inches. In the southern Sierra Nevada, oak and white fir were the tree species most frequently used for resting (Truex et al 1998). Down logs greater than 30-inch maximum diameter accounted for approximately 85 percent of all logs used as rest sites (Truex et al 1998), indicating the importance of large woody debris in the forest habitat.

Selection of natal (birthing) and maternal (kit raising) dens is highly specific. Habitat components must exist in the proper juxtaposition within specific habitats in order to provide a secure environment for birth and rearing of fisher kits. All known natal and maternal dens in the western United States have been in large diameter coarse woody debris, snags, or cavities of large diameter live conifers or oaks (Powell and Zielinski 1994, Zielinski et al. 1995, Truex et al. 1998).

Natal dens, where kits are born, are most commonly in tree cavities at heights of greater than 20 feet, while maternal dens, where kits are raised, may be in cavities closer to the ground so active kits can avoid injury in the event of a fall from the den (Lewis and Stinson 1998). Most natal and maternal dens are in large conifers (white fir in southern Sierra, Douglas fir in Eastern Klamath) or oaks (black oak in southern Sierra), which may be live or in snag form (Truex et al. 1998). Only eight fisher natal and maternal dens are known in the Sierra Nevada.

The fisher is found in North America, from the mountainous areas in the southern Yukon and Labrador Provinces in Canada southward to central California and Wyoming, the Great Lakes and Appalachian regions, and New England (Nowak and Paradiso 1983). In California, the subspecies (*M. p. pacifica*) occurs in the northern Coast Ranges and Klamath Province at elevations of 82 to 3,280 feet (Golightly et al. 1997), and occurs sympatrically with the marten in the southern Sierra Nevada at elevations of 5,000 to 8,500 feet in mixed conifer forests (Zielinski et al. 1996). The fisher historically occurred in the Lassen, Plumas, Tahoe, Lake Tahoe Basin, Eldorado, Stanislaus, Sierra, and Sequoia National Forests, but was not known to occur in the Modoc, Inyo or Humboldt-Toiyabe National Forests. Fishers in the Sierra Nevada currently appear to occupy less than half of their historic range (Zielinski et al. 1997). Recent surveys indicate that fisher are absent from their former range for a distance of almost 240 miles in the central and northern Sierra, from Yosemite National Park northward (Zielinski et al. 1995). This gap in distribution may be effectively isolating the existing southern Sierra Nevada population in the Sequoia National Forest and a portion of the Sierra National Forest, from the remainder of the fisher's range in California, Oregon, and Washington. The southern Sierra Nevada population is the species' southern extent of its range.

Environmental Baseline

Pacific fisher

The Service was petitioned to list the fisher under the Act in 1990 and 1994. In both cases, the Service reported that there was insufficient information to make a determination (56 **FR** 1159 and 61 **FR** 8016). A third petition was submitted to the Service on November 27, 2000.

Fishers are long-lived, have low reproductive rates, large home ranges (for carnivores of their size) and exist in low densities throughout their range. This implies that fishers are highly prone to localized extirpation, colonizing ability is somewhat limited, and that populations are slow to recover from deleterious impacts. Isolated populations are therefore unlikely to persist. Habitat connectivity is a key to maintaining fisher within a landscape.

Fisher populations are presently at low numbers or absent throughout most of their historic range in Montana, Idaho, Washington, Oregon, and California (Heinemeyer and Jones 1994). In recent decades, a scarcity of sightings in Washington, Oregon, and the northern Sierra Nevada may indicate fisher extirpation from much of this area (Aubry and Raley 1999, Carroll et al. 1999, Zielinski et al. 1996). The Sierra Nevada and northwestern California populations may be the only naturally-occurring, known breeding populations of fishers in the Pacific region from southern British Columbia to California (Zielinski et al. 1997). Moreover, mortality rates of adult female fishers in the southern Sierra Nevada population appear to be high (Truex et al. 1998). No empirical population estimates are available for California, but fishers are considered rare. Because fishers occur at lower elevations than martens, they are more likely to be directly affected by human activities.

The action area is located within and around the remaining known Pacific fisher population in the Sierra Nevada. The southern Sierra Nevada population is considered vulnerable to disturbance yet essential for the survival and recovery of the Pacific fisher. This is the only remaining Sierra Nevada population and represents the southernmost extent of the species' range. The southern Sierra Nevada population is therefore the population with the highest potential to recolonize the central and northern Sierra Nevada. Range expansion to previously occupied habitat, reestablishment of connectivity with California's northwestern subpopulations, and future reintroduction efforts, if they are to be successful, all depend on a robust southern Sierra Nevada population.

Status of the Species

Mariposa pussypaws

Mariposa pussypaws (*Calyptridium pulchellum*) was listed as threatened without critical habitat in September, 1998 (USFWS 1998). One occurrence of this plant is found in association with another rare plant, Mariposa lupine (*Lupinus citrinus* var. *deflexus*). The California Native Plant Society has placed this species on List 1B (rare or endangered throughout its range). Mariposa pussypaws is a small, compact, attractive, herbaceous annual plant belonging to the purslane family (Portulacaceae). This plant has fibrous roots and many prostrate stems. Stems form a small rosette and the leaves are spatula-shaped. Both stems and leaves have smooth surfaces. Flowers appear in April and May. Flowers occur in loose clusters at the end of stems. Petals are rose-colored. The anthers are yellow and the styles are hidden within the flower. The seed capsule is two-valved.

This species is found on decomposed granitic sands on foothills and slopes in Mariposa County, mostly on south-facing slopes. Little else grows on these shallow, bare substrates. The elevation range is between 1,500-3,600 feet. The seven small populations are scattered over a 750 square mile area. Six populations are on private land and the remaining one is in the Sierra National Forest. Judging from early botanical literature, this plant has never been much more widely distributed than it is today.

The prostrate growth habit makes this plant a poor competitor with taller grasses and any other dense vegetation. Its adaptation to a harsh, exposed setting makes it unusual. Seed production is somewhat low for an annual. All known stands are quite small. Mariposa pussypaws is threatened by urbanization, small size of populations and small number of populations across most all of its range.

Status of the Species

Springville clarkia

Springville clarkia (*Clarkia springvillensis*) was listed as threatened without critical habitat in September, 1998 (USFWS 1998). The California Fish and Game Commission listed the species as endangered in 1979. The California Native Plant Society considers the species to be on the 1B list. Springville clarkia is an erect annual herb belonging to the evening-primrose family (Onagraceae). The plant can grow to 3 feet in height. It has simple or, more usually, branched stems. The bright green leaves can grow to 3 inches long and 1 inch wide. Lavender-pink flowers appear in May to July and may have a characteristic purple spot at the base of the flower.

Features on the outside of the flower that separate this clarkia from others growing near it include color and the absence of long hairs.

Springville clarkia is found on granitic soils in openings in the blue oak (*Quercus douglasii*) woodlands and on road banks. It can be found at elevations between 1,200 and 3,000 feet. All known populations are found in Tulare County. Eight of the nine populations are found within a 43 square mile area. The ninth population is 16 miles northwest. Four are on lands administered by the Sequoia National Forest, three on private land, one on land owned by Tulare County and part of one on land owned by the California Department of Fish and Game.

The largest population is found inside the Springville Clarkia Preserve, which is owned by the California Dept. Fish and Game. That population was impacted by the construction of a road and site leveling prior to construction of a home. The number of plants in this population is larger than the combined total of the other populations. Urbanization, roadway maintenance activities, inadequate regulatory mechanisms, limited range and heavy livestock grazing threaten Springville clarkia.

Status of the Species

Slender Orcutt grass

Slender Orcutt grass was listed as threatened on March 26, 1997 (USFWS 1997). The species was also listed as endangered by the California State Fish and Game Commission in 1979. The California Native Plant Society regards slender Orcutt grass as a 1B plant species. No recovery plan exists for this species. Slender Orcutt grass is a small, weakly tufted annual in the grass family (Poaceae). The plant has several stems 2-6 inches tall, ending in an elongate inflorescence of scattered spikelets. The lemmas are deeply cleft into fine, equal-length, prominent teeth that are sharp-pointed or short-awned. Foliage is grayish, with sparse hairs. The erect stems often branch from the upper nodes. Slender Orcutt grass occurs in vernal pools within valley grassland and blue oak woodland. It occurs in vernal pools on remnant alluvial fans and high stream terraces and recent basalt flows. It has some ability to colonize artificial habitats, such as the margins of stock ponds (Stone et al. 1988).

Slender Orcutt grass is restricted to northern California. Scattered, disjunct populations occur in the Sacramento Valley from Siskiyou County to Sacramento County. Most of the 75 native extant populations are in Shasta County (18 native and one translocated) and Tehama County (32). The species is also found in Lake, Lassen, Plumas, Sacramento and Siskiyou counties. Eighteen populations occur on the Lassen National Forest.

Several historically known populations have been eliminated by agricultural conversion, airport construction, and wetland draining for mosquito abatement. Many undocumented populations were probably lost during the intensive agricultural development that eliminated many vernal pools in the Central Valley. Twenty-three populations are variously threatened by urbanization, altered hydrology, off-highway vehicles, and competition from nonnative weeds. Populations are protected at The Nature Conservancy's Boggy Lake Preserve (Lake County) and Vina Plains Preserve (Tehama County). Most of the populations on non-Federal lands are not protected.

Status of the Species

Layne's Butterweed

Layne's butterweed (*Senecio layneae*) was listed as threatened without critical habitat in October, 1996 (USFWS 1996). The California State Fish and Game Commission designated Layne's butterweed a rare species in 1979. The California Native Plant Society considers Layne's butterweed to be on the 1B List. In 1998, the Service published a draft recovery plan for gabbro soil plants of the Central Sierra Nevada Foothills and included Layne's butterweed in that plan. Layne's butterweed is a perennial herb of the aster family (Asteraceae) that sprouts from a rootstock. Its mostly basal lance-shaped leaves are 3 to 10 inches long. The several flower heads are 2 to 3 inches wide, each having five to eight orange-yellow ray flowers and many yellow disk flowers. Flowers appear between April and June.

Layne's butterweed grows on gabbro- and serpentine-derived soils. Gabbro-derived soils originate from mafic rocks (gabbrodiorite) that are mildly acidic, are rich in iron and magnesium, and often contain other heavy metals such as chromium (Wilson 1986). Gabbro, a dark large-crystalled rock, is formed when liquid magma cools slowly underground. A red soil is formed when the rock is exposed and weathers at the earth's surface (EIP Associates 1991). These soils are well-drained and are underlain by gabbrodiorite rocks at a depth of more than 3 feet.

Serpentine-derived soils are formed through a process similar to formation of gabbro-derived soils. Serpentine soils are derived from ultramafic rocks (e.g., serpentinite, dunite, and peridotite). They tend to have high concentrations of magnesium, chromium, and nickel, and low concentrations of calcium, nitrogen, potassium, and phosphorus (Kruckeberg 1984). Gabbro soils are considered edaphically similar to serpentine because of their mineral composition and because they appear to influence plant distributions in much the same way (Wilson 1986).

Layne's butterweed grows in open rocky areas within chaparral plant communities. Most known sites are scattered within a 40,000 acre area in western El Dorado County that includes the Pine Hill intrusion and adjacent serpentine. A few other colonies occur in the El Dorado National Forest in El Dorado County, in the Bureau of Land Management (BLM) Red Hills Management Area in Tuolumne County (BioSystems Analysis, Inc., 1984), and on BLM land in Yuba County (Al Franklin, pers. comm. 1997). However, most colonies are on privately owned land. One site is on land managed by California Department of Forestry and California Department of Fish and Game. In El Dorado County, Layne's butterweed often grows in association with other state and federally listed plants including; Stebbins' morning glory (*Calystegia stebbinsii*), Pine Hill ceanothus (*Ceanothus roderickii*), Pine Hill flannel-bush (*Fremontodendron decumbens*), and El Dorado bedstraw (*Galium californicum* ssp. *sierrae*).

Residential and commercial development, road maintenance, change in fire frequency, off-road vehicle use, competition with invasive alien vegetation, excessive horse paddocking, mining, and other human-caused conditions threaten and are responsible for the declining trend for *Senecio layneae* (CDFG 1990; CNDDB 1994).

Status of the Species

Greene's tuctoria

Greene's tuctoria (= Greene's Orcutt grass) (*Tuctoria greenei*) was listed as endangered without critical habitat on March 27,1997. (USFWS 1997). The California Fish and Game Commission listed the species as endangered in 1979. The California Native Plant Society lists this species as 1B plant. No recovery plan exist for this species. Greene's tuctoria is a small, tufted annual in the grass family (Poaceae). The plant has several to many stems 2-6 inches tall, each ending in a spike-like inflorescence that may be partly enfolded in the upper leaf. The genus *Tuctoria* is distinguished from other Orcutt grasses (in the genus *Orcuttia*) by the spiral arrangement of the spikelets (flowers) and other characteristics of its flower parts (Stone et al. 1988;USFWS 1997). Greene's tuctoria occurs in small or shallow vernal pools or the early drying sections of large, deep vernal pools (Stone et al. 1988).

Greene's tuctoria is restricted to vernal pools in the Central Valley. Its historical range included parts of Shasta, Tehama and Butte Counties in the northern Sacramento Valley, and extended from San Joaquin County to Tulare County in the San Joaquin Valley. The taxon no longer occurs in Fresno, Madera, San Joaquin, Stanislaus and Tulare Counties. The 19 remaining populations are in Shasta, southern Tehama, Butte, Glenn, and eastern Merced Counties (CDFG 1992;USFWS 1997). One population occurs on private lands within the Lassen National Forest.

At least nine historic populations of Greene's tuctoria have been eliminated by conversion of habitat to irrigated agriculture. Six historic populations are known or presumed to have been eliminated by grazing, and at least one population has been eliminated by urbanization. Agriculture, grazing and urban development continue to threaten most of the 19 remaining populations (CDFG 1992;USFWS 1997). All are on private land. Four are at The Nature Conservancy's Vina Plains Preserve, but three of these are grazed by cattle (CDFG 1992;USFWS 1997).

Environmental Baseline

Mariposa pussy-paws, Springville clarkia, slender orcutt-grass, Layne's butterweed, Greene's tuctoria

None of the five federally listed plant species have a final Service-approved recovery plan.

Regarding *Calyptridium puchellum*, six populations are on private land and the remaining one is in the Sierra National Forest. The population on the Sierra Nevada Forest is fenced to protect the species from grazing and trampling and is censussed every other year. The other populations of *Calyptridium puchellum* occur on private lands and are variously threatened by urban development, off-highway vehicle use, and competition from non-native weeds. *Clarkia springvillensis* is known from 20 populations in the Tule River basin watershed of Tulare County. Eight populations of *Clarkia springvillensis* occur on the Sequoia National Forest and are monitored annually. Evidence of livestock grazing and trampling has been documented at some of the more heavily used sites. Competition from non-native grasses, herbaceous annual plants and chamise may pose risk factors of equal magnitude. Implementation of appropriate grazing regimes and the reintroduction of prescribed fire have been suggested a means to reduce competing non-native flora and promote the survival of the species. Research needs to be conducted to assess the effects to *Clarkia springvillensis* on the various timings and intensities of commercial livestock grazing and prescription burning. *Orcuttia tenuis* is known from 73 populations occurring mostly in Shasta and Tehama counties. Eighteen populations of *Orcuttia tenuis* occur on the Lassen National Forest. The Lassen National Forest implemented a species management guide for *Orcuttia tenuis* which protects the species from direct disturbance by Forest Service management activities. *Tuctoria greenei* is known for 19 populations, one of which is on private lands within a Lassen National Forest grazing allotment in Shasta County. Currently, the Lassen National Forest permits a season of use resulting in no trampling or grazing impacts to that population of *Tuctoria greenei*. *Senecio layneae* grows within open rocky areas within the chaparral plant communities. Most known sites of *Senecio layneae* are scattered within a 40,000 acre area in western El Dorado County that includes the Pine Hill intrusion and adjacent serpentine. A few small colonies occur in the El Dorado National Forest in El Dorado County, in the Bureau of Land Management (BLM) Red Hills Management Area in Tuolumne County (BioSystems Analysis, Inc., 1984), and on BLM land in Yuba County (Al Franklin, pers. comm. 1997). However, most colonies of *Senecio layneae* are on privately owned land. The Service published a Draft Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills and included *Senecio layneae*. The Service lacks detailed information about reproductive biology, ecological niche requirements, pollinators, competitors, and rangewide and individual population status and trends for any of the federally listed plant populations on Federal lands.

Effects of the Action

Effects of the proposed action on federally listed species are considered additive to other past and present effects on the species and their habitat. The ability of these species to survive and recover within the action area are measured against their ability to survive and recover in the absence of the proposed action. The effects of the proposed action and our determination are evaluated herein based on the assumption that all protective measures described in the RBA, FEIS, and ROD will be fully implemented and/or enforced.

Direct effects are the immediate effects on the species and their habitat caused by the proposed action and any interrelated and interdependent actions that result from it. Indirect effects are caused by the proposed action that are later in time and reasonably certain to occur. The following section of this biological opinion represents the Service's assessment of the effects of the proposed action. This assessment examines the programmatic effects of the quantifiable and narrative standards and guidelines on federally listed species. These standards and guidelines were developed to provide management direction for the five problem areas (old forest ecosystems and associated species, aquatic, riparian, and meadow ecosystems and associated species, fire and fuels, noxious weeds, and lower west side hardwood forests). Quantifiable standards and guidelines were developed as guidance on timber harvests, dead and down wood retention requirements, fire and fuels management, grazing, and water quality. Narrative standards and guidelines were also developed to provide guidance on the management of roads, mining, recreation, timber salvage, hazard tree removal, pesticide applications, emergency fire suppression efforts; the implementation of Best Management Practices, soil quality standards; the administration of special use permits; and the reclamation of abandoned mine sites. This assessment therefore reflects the Service's opinion as to whether the proposed action is likely to jeopardize the continued existence of listed species or foreclose future management options for the five petitioned species; it does not authorize take for any of the species.

Effects of the Proposed Action

Valley Elderberry Longhorn Beetle

Adverse effects to the valley elderberry longhorn beetle from the proposed project consist primarily of removal of elderberry shrubs during the implementation of fire and fuel management activities below 3,000 feet in elevation, including the construction of fire lines, skid trails, and landing sites. Removal of elderberry shrubs is a direct effect and constitutes take of the beetle via the harassment and mortality of adults, attached and unhatched eggs, and embedded larvae. Other direct effects involve damage to the shrub from passing vehicles and/or road maintenance and widening. Additional impacts could result from the application of herbicides in or adjacent to beetle habitat. Impacts including direct mortality and loss of host plants could be associated with the use of pesticides, their derivatives, or their dispersants. These potential impacts will be ameliorated to some extent in circumstances where elderberry plants occur within riparian conservation areas. However, elderberry plants are not riparian dependent and may occur greater than 150-300 feet from the nearest aquatic feature. In addition, project level activities may occur within RCAs if compatible with resource conservation objectives.

Livestock grazing within the action area may also impact the valley elderberry longhorn beetle through trampling of the beetle's host plant. Livestock grazing can damage or destroy mature elderberry individuals or preclude the recruitment of additional elderberry plants. Indirect effects include soil compaction, habitat degradation, and promotion and spread of nonnative plants. Also, grazing of livestock within stream channels can alter channel hydrology resulting in the loss of riparian areas supporting elderberry plants through channel widening, channel degradation, or lowering of the water table.

Indirect effects to the beetle could result from habitat fragmentation through the removal elderberry plants and associated riparian vegetation. Habitat fragmentation can inhibit dispersal and colonization of beetles between remaining habitat areas. Fragmentation may lead to population declines and localized extinctions by dividing a population into smaller, isolated subpopulations in restricted areas. These smaller populations may then be adversely affected by inbreeding depression, genetic drift, and other problems associated with small population size (Primack 1998). In addition, soil disturbance or erosion can occur during and after mechanical treatments, prescribed fires, grazing, recreation, and maintenance and use of roads resulting in the removal of beetle habitat including host plants downstream of project areas.

The Service does not anticipate any adverse effects to beetle critical habitat because it occurs well away from the proposed project area. Therefore, no further analysis will be done on this matter.

The proposed action includes a variety of measures, if fully implemented, will provide for improved habitat conditions for valley elderberry longhorn beetles. These measures include implementing relevant recovery actions identified within final recovery plans, as well as all of the standards and guidelines designed to minimize or avoid impacts to valley elderberry longhorn beetles. Furthermore, all project level activities that may adversely affect valley elderberry longhorn beetles will be analyzed for consistency with the various goals and strategies of the proposed action and for compliance with the Act. If these project level actions are consistent with the goals outlined in the proposed action then the results would be protective and restorative for valley elderberry longhorn beetles and their critical habitat.

Effects of the Proposed Action

Owens Tui Chub

Potential direct effects to Owens tui chub from resource management activities includes modification or loss of habitat or habitat components and direct loss of individuals resulting from facilities maintenance (including roads), recreation, or other activities within occupied habitat.

Livestock grazing within the action area may also impact Owens tui chub. Grazing has been identified to potentially contribute to the decline of populations due to improper grazing in riparian habitats. Most grazing allotments depend on existing natural water features to water cattle. Improper management of grazing (e.g., overgrazing riparian and meadow areas) can lead to nutrient loading, reduction of shade and cover, changes in stream channel morphology and hydrology, and the addition of sediment due to bank degradation and offsite soil erosion. The most significant affect is hydrological changes associated with the increase in peak flow discharge and the resulting decrease in non peak flows. The effects of grazing on woody vegetation can be significant. Grazing can eliminate woody species over time, resulting in a loss of pool habitats and suitable streambank cover habitat. The modification of hydrology and the loss of habit pose the most significant potential impacts associated with grazing.

Roads along streams also represent potential direct impacts to Owens tui chub. Erosion and sediment delivery is often increased in streams possessing road crossings. Although the decommissioning of roads is proposed as part of the Preferred Alternative, this task will not be immediately completed and will therefore continue to be a chronic impact to aquatic species in general.

Impacts could result from the application of pesticides (primarily herbicides) in or adjacent to Owens tui chub habitat as only areas known to be occupied by Owens tui chub (or other threatened, endangered, or sensitive species) will be avoided. Direct impacts including mortality, morbidity, predation (due to lack of cover), and loss of prey species could be associated with the use of pesticides, their derivatives, or their dispersants.

Furthermore, potential indirect effects may result from activities that affect suitable habitat located adjacent to occupied habitat. Indirect effects can include increased water temperature or sediment input to essential habitat associated with mechanical treatments, prescribed fire, grazing, recreation, and maintenance and use of roads. In addition, soil disturbance or erosion can occur during and after mechanical treatments, prescribed fires, grazing, recreation, and maintenance and use of roads resulting in sedimentation and other negative impacts. Finally, geothermal activities or groundwater pumping authorized or agreed upon by the Forest Service may result in the diminishing water quality and/or quantity.

The action area is located within and around the two highest priority Conservation Areas for the recovery of the Owens tui chub. Hydrological changes due to improper grazing, mechanical treatment, prescribed fire, road maintenance, recreation use and other proposed and ongoing activities will occur. Watershed analysis within CARs and not implementing activities in areas identified as essential (e.g., Conservation Areas per the Recovery Plan) should help minimize these effects. Watershed analysis will require consideration of the direct and indirect impacts of proposed and ongoing activities that may affect Owens tui chub.

The proposed action includes a variety of measures if fully implemented, provide for improved habitat conditions for Owens tui chub. These measures include implementing relevant recovery actions identified within final recovery plans, as well as all of the standards and guidelines designed to minimize or avoid impacts to Owens tui chub. Furthermore, all project level activities that may adversely affect Owens tui chub will be analyzed for consistency with the various goals and strategies of the proposed action and for compliance with the Act. If these project level actions are consistent with the goals outlined in the proposed action then the results would be protective and restorative for Owens tui chub and their critical habitat.

Effects of the Proposed Action

Paiute Cutthroat trout, Lahonton cutthroat trout, California golden trout, Little Kern golden trout Modoc sucker, Lost River sucker, Short-nose sucker, Warner sucker

Grazing

Grazing has caused degradation of habitat in the project area in the past and the proposed action will not totally avoid adverse effects associated with grazing. The proposed action may delay recovery of riparian conditions and fish populations and when measured against no authorized grazing, the proposed action is likely to adversely affect these species.

Impacts of livestock grazing to stream habitat and fish populations can be separated into acute and chronic effects. Acute effects are those which contribute to the immediate loss of individuals, loss of specific habitat features (undercut banks, spawning beds, etc.) or localized reductions in habitat quality (sedimentation, loss of riparian vegetation, etc.). Chronic effects are those which, over a period of time, result in loss or reduction of entire populations of fish, or widespread reduction in habitat quantity and/or quality.

Livestock grazing can affect riparian areas by changing, reducing, or eliminating vegetation, compacting soils, trampling streambanks, wading in the streams, defecating or urinating in or near streams, and by the loss of riparian areas through channel widening, channel degradation, or lowering of the water table. Behnke and Zarn (1976) identified livestock grazing as the greatest threat to the integrity of stream habitat in the western United States. Numerous symposia and publications have documented the detrimental effects of livestock grazing on streams and riparian habitats (Johnson and Jones 1977; Meehan and Platts 1978; Behnke and Raleigh 1979; Bowers et al. 1979; Cope 1979; AFS 1980; Platts 1981 and 1990; Ohmart and Anderson 1982 and 1986; Peek and Dalke 1982; Kauffman et al. 1983; Menke 1983; Kauffman and Krueger 1984; Johnson et al. 1985; GAO 1988; Clary and Webster 1989; Gresswell et al. 1989; Kinch 1989; Minshall et al. 1989; Chaney et al. 1990 and 1993).

Effects on fish habitat can include nutrient loading, increased concentrations of ammonia or other potentially toxic constituents, increased levels of bacteria or other pathogens, reduction of shade and cover with resultant increases in water temperature, increased frequency of intermittent flows, changes in stream channel morphology, and the addition of sediment due to bank degradation and off-site soil erosion. Removal of streambank vegetation through grazing decreases shade and cover which promotes greater temperature fluctuations, reduced allochthonous inputs, decreased water storage capacity, and increased erosion potential and reduced capacity for capture of sediments. Increase in width to depth ratio results in increased frequency of intermittent flows, reduction in water table and initiation of headcuts.

Small, intermittent headwater tributary streams which are important for spawning and nursery areas for annual recruitment may have been significantly impacted from livestock grazing because of loss of minimal flows during late summer. Reduced streambank storage of water for summer flows, lack of cover for small intermittent pools, and increased water temperatures may reduce survival of recently hatched fry.

Some rangelands addressed in this biological opinion support plant communities that are in early seral stages, due to decades of intense season-long grazing. When most of the watershed is in an early seral stage, it is inherently less stable than a similar site in a mostly mid-to late seral stage. Plants in the early seral stage community do not provide as much protection for the watershed and streambanks. Many forbs and annual plants that frequently dominate early seral plant communities do not have the strong root systems of the displaced perennials such as sedges, rushes, bunch grasses, shrubs, and willows. Elmore and Kauffman (1993) recommend that season-long grazing from spring to fall should be eliminated in most areas where it is being used.

Even if mid-to late seral plants are not displaced, moderate to heavy grazing can affect the ability of the vegetation to resist erosion. Root patterns with no grazing or light grazing are generally dense, heavily branched, spreading, and deeply penetrating. Under progressively heavier grazing, roots have progressively fewer branches, and are sparser, shorter, and more concentrated in the top portion of the soil profile (Vallentine 1990). When watersheds with primarily early seral, or late seral plants with reduced root systems experience a major flood event, they are more likely to suffer serious damage to the riparian habitat.

The effects of grazing on woody vegetation is critical because of the importance of woody debris in providing nutrients, structure, and pool formation and the streambank stability, shading, and microclimate effect of riparian trees and shrubs. Improper grazing can eliminate woody species over time. While mature trees approach senescence, excessive grazing pressure can prevent the establishment of seedlings (Carothers 1977, Glinski 1977). On a stream rested from continuous grazing for ten years, Claire and Storch (unpublished) found alders and willows provided 75 percent more cover than areas that had been devoid of shrub canopy cover before exclosures. Similar grazing-woody vegetation relationships have been reported by Crouch (1978), Duff (1979), Kauffman (1982) and others.

Removal of vegetation by grazing can expose soils, increase erosion potential, and affect the groundwater storage capacity. Streamside vegetation protects and stabilizes streambanks by binding soils to resist erosion and trap sediment (Chaney et al. 1990). Vegetative cover also insulates streambanks from frost-heaving and freeze-thaw cycles which alter soil strength and promote conditions for erosion (Bohn 1989). When bank vegetation is removed and plant roots do not help bind the soil, tension cracks can develop and lead to bank failure (Platts 1990). Where erosion proceeds unabated, extensive deep gullies can develop, lowering the water table. Conversely, if vegetation becomes established and total vegetative biomass increases along a stream, channels typically begin to aggrade (Elmore and Beschta 1987).

With continued sediment deposition and bank-building, water tables rise and ultimately may reach the root zone of plants on former terraces or floodplains (Elmore and Beschta 1987). In one example, "The area inside the fences responded dramatically. Streambanks healed. The stream channel narrowed and deepened. Within five years the riparian area had roughly doubled in width due to the elevated water table. Huff Creek narrowed by about one-third,

doubling in depth, and water temperatures had declined. The percentage of eroding streambanks decreased from about 80 percent to 20 percent," (Platts 1990).
At least four to six inches of residual stubble or regrowth is recommended to meet the requirements of plant vigor, maintenance, bank protection, and sediment entrapment (Clary and Webster 1989). More than six inches of stubble height may be required for protection of critical fisheries or easily eroded streambanks (Clary and Webster 1989). Holechek (1988) listed 30 to 40 percent as the average utilization the primary forage species in range types addressed in this biological opinion can sustain without loss of productivity. Holechek (1988) qualifies the 30 to 40 percent utilization levels by saying "ranges in good condition and/or grazed during the dormant season can withstand the higher utilization level, while those in poor condition or grazed during active growth should receive the lower utilization level.

Ratliff et al. (1987) suggested that in California's Sierra Nevada meadows, the herbage remaining after grazing should equal the proportion of production that decomposes annually. This translates into utilization rates of 35 to 45 percent on excellent condition meadows and 20 to 30 percent on poor condition meadows (Clary and Webster 1989). The maximum utilization rate for riparian areas (20 to 30 percent for streams in unsatisfactory or unknown condition, or with a static or downward trend) in the proposed action area is within these suggested guidelines and should allow recovery of listed aquatic species habitats.

When livestock graze directly on streambanks, mass erosion from trampling, hoof slide, and streambank collapse may cause soils to move directly into the stream (Platts 1990). Soil moisture exceeding 10 percent creates conditions for the greatest amount of streambank alteration from livestock trampling (Marlow and Pogacnik 1985). Heavy trampling by livestock can compact soils, reducing the infiltration of overbank flows and precipitation. Reduced infiltration and increased runoff may decrease the recharge of the saturated zone and increase peak flow discharges (Platts 1990). Riparian areas in poor condition are unable to buffer the effects of accelerated runoff. Doubling the speed of streamflow increases its erosive power by four times and its bedload and sediment carrying power 64 times (Chaney et al. 1993). Accelerated runoff can cause unstable stream channels to downcut or erode laterally, accelerating erosion and sediment production (Chaney et al. 1993). Lateral erosion results in progressively wider and shallower stream channels that can adversely affect fish populations.

Trampling affects the hydrology of the watershed. Accelerated runoff only temporarily increases streamflow and decreases the amount of water retained in the watershed to sustain base flows. Greater water yields have been demonstrated in grazed compared to ungrazed areas (Liacos 1962; Hanson et al. 1970; Lushby 1970). Alderfer and Robinson (1949), Bryant et al. (1972), Orr (1960), and Rauzi and Hanson (1966) all found soil compaction increased linearly with increased grazing intensity. Rauzi and Hanson (1966) found water intake rates on a moderately grazed watershed to be nearly twice that on the heavily grazed watershed. Water intake rates on the lightly grazed watershed was nearly four times that on the heavily grazed watershed and over twice that on the moderately grazed watershed. Heavy grazing compacted the soils and significantly decreased the pore spaces in the top four inches of the soil when compared to light grazing.

To reduce effects of livestock trampling, the proposed action will allow no more than 10 percent streambank trampling in LCT habitat and 20 percent in other habitats not occupied by LCT. Relative to no authorized grazing, the streambank trampling may delay recovery of streambank stability and infiltration rates and reduce the availability of habitat associated with undercut banks or overhanging vegetation. However, if used in combination with removal of cattle relatively early in the growing season, regrowth of vegetation should minimize the effects of any minor streambank disturbances and allow recovery of streambanks and channels in the listed aquatic species' watersheds.

Sediment introduced into streams can adversely affect fish populations by inducing embryo mortality and altering primary productivity and food supply. Deposition of silt in spawning beds can fill interstitial spaces and streambed material, impeding water flow, reducing dissolved oxygen levels in the gravels, and restricting metabolic waste removal (Chapman 1988; Bhornn and Reiser 1991). Suspended sediments reduce light penetration to plants and reduce oxygen carrying capacity of water (Ohmart and Anderson 1982). Reduction in photosynthesis and primary production decreases productivity of the entire ecosystem (Minshall et al. 1989). Additionally, sedimentation directly decreases the amount of substrate suitable for some invertebrates and reduces instream cover for fish.

Various studies have shown that water temperatures have been reduced when streambank vegetative cover is protected from grazing. Storch (1979) found that daily fluctuations of water temperatures in late August and early September averaged 27° F outside an exclosure on Camp Creek, Oregon, compared to 13° F. inside an exclosure that was ungrazed for 10 years. Also, maximum water temperatures outside the exclosure average 11° F higher than inside the exclosure. Van Velson (1979) reported that average water temperatures in Otter Creek, Nebraska decreased 3° F after livestock were excluded for 1 year.

Another temperature-related factor is the potential for less winter survival of fish in grazed areas. Streams with little or no vegetative canopy are susceptible to the formation of anchor ice on the bottom of the stream (Platts 1983). Heavily grazed areas may be less suitable for fish overwintering because stream channels in such areas tend to be wider and shallower and thus, are more susceptible to freezing throughout the water column. Fish mortality may also occur if the winter carrying capacity of the ungrazed section is exceeded by an influx of fish migrating from grazed sections containing unsuitable habitat. In small streams, the potential is high for reduced fish survival during seasonal winter and summer low-flow periods if stream conditions have been adversely affected by livestock grazing (Platts 1990).

Livestock grazing can cause a nutrient loading problem (due to urination and defecation in the water) in areas where cattle are concentrated near water (Doran et al. 1981). The nutrient status of streams can markedly influence the growth of their microflora and microfauna, and directly and indirectly affect many other characteristics of the biota (Lemly 1998). In some situations, such enrichment may be considered beneficial if the increase in primary and secondary productivity is translated into larger populations of fish valued by society (Rasmussen 1986; Lenat and Crawford 1994). However, there is a threshold for biological stimulation beyond which elevated nutrients have detrimental effects (Lemly 1998). Growth of filamentous bacteria on aquatic insects bodies and gills was demonstrated as a result of nutrient loading in livestock use pastures, and significantly lower densities of insects (up to 66 percent less) occurred in downstream sites (Lemly 1998). Aquatic insects were demonstrated to suffer extensive mortality because of this bacterial growth in laboratory and field studies and can have a major influence on stream insect populations (Lemley 1998).

Localized contamination of surface water, ground water, and soil itself can result from animals in pastures and rangelands. Research reports show that livestock operations may cause increased coliform bacterial pollution in rangeland streams. Although fecal coliforms themselves are not pathogenic, they indicate that pathogens could exist and possibly flourish. Fecal streptococci may also be a reliable and definitive measure of human or animal pollution. The extent of pathogens depends largely on livestock density, timing of grazing, frequency of grazing, and access to the stream. Fecal coliform levels tend to increase as intensity of livestock use increases. Maintaining the health of livestock is critical and proper management of the herd, its byproducts, and surrounding land areas is essential. Increased bacterial pollution of streams may increase the susceptibility of these fish species to disease.

Riparian vegetation contributes significantly to fish carrying capacity in smaller streams (Wesche et al. 1985 and 1987). Riparian vegetation provides organic material for approximately 50 percent of a stream's nutrient energy (Cummins 1974). Detritus from such plants is a principal source of food for aquatic invertebrates (Minshall 1967; Meehan et al. 1977). Streamside vegetation also provides habitat for terrestrial insects, another important dietary component for both trout and other aquatic or riparian associated species. Relative to no livestock grazing, the proposed action will reduce streamside vegetation in some areas and may increase nutrients and invertebrates in riparian areas. The proposed action should increase streamside vegetation and reduced nutrient loading compared to past grazing management. An increase in riparian vegetation along creeks and springs could produce positive effects on nutrient supplies and aquatic and terrestrial invertebrates.

Other adverse effects of livestock grazing on aquatic fish species include wallowing and wading in streams. Wading in streams by livestock can induce mortality to eggs and pre-emergent fry at least equal to that demonstrated by human wading (Roberts and White 1992). In that investigation, a single wading upon a simulated spawning bed induced 43 percent mortality of prehatching embryos. Therefore, livestock wading in spawning habitat during spring - early summer has potential for direct take of listed aquatic species.

Ground Disturbing Activities

Ground disturbance from off-highway vehicles (OHV), and dispersed recreation, as proposed, would be below 20 percent of stream reach or 20 percent of natural lake and pond shorelines, however, this does not apply to developed recreation sites and designated OHV routes. These activities will continue to cause streambank disturbance and trampling from humans, and will have adverse effects to riparian vegetation.

Mining

The proposed project would allow mining activities to continue in areas that may have adverse effects on these fish species. Mining affects the aquatic environment by producing sediment, changes in pH levels, toxic heavy metal concentration, and alteration of stream channels and water flows. In addition cross-valley fills of overburden material may result in acid generating runoff which may adversely affect fish and the macroinvertebrate community. For example, Lahontan cutthroat trout can accumulate heavy metals and other toxicants from sediments, the water column, or from aquatic macroinvertebrates in their diet as discussed in Tuttle et al. (1998).

Roads

The Biological Assessment states that roads along streams would be a priority for decommissioning. As proposed, FW-RD03F would allow for new road construction in areas that are occupied by listed aquatic species. Roads fragment, alter, and destroy habitats and frequently replace them with a zone of human activity. Roads increase access leading to increased disturbance. Roads can be barriers to some terrestrial and aquatic species depending upon features of the road and frequently increase animal mortality from vehicular collisions and increased hunting and fishing access. Roads cause an increase in soil erosion. Culverts and bridges built for road access generally change the dynamics of the aquatic system and frequently creates migration barriers for aquatic species and can reduce habitat suitability near the structure. Road crossings on streams generally make that portion of the stream shallower and wider, increasing downstream sediment loading and siltation. In some cases, roads are sources of upstream headcuts.

Noxious Weeds

As proposed, the application of herbicides would be allowed adjacent to fish habitats. Some direct impacts to these species could occur, although specific impacts of herbicides are not known for the various life stages of these fish species.

Fire suppression

Fire suppression facilities could be located within RCAs or CARs or other areas where fish habitat is present. Facilities potentially could compact, remove or damage riparian vegetation. Depending on the location of the facilities, after areas are used, bare soils could lead to erosion and water quality concerns.

Water drafting pumps could entrain eggs and juvenile fish if they were used in occupied areas.

Fish stocking

The development of a policy to reduce and/or eliminate fish stocking on FS lands to minimize the negative to aquatic/riparian dependent species. If the policy does not fully endorse the elimination of non-native fish stocking in habitats which are essential for the recovery of listed species it will continue to have negative impacts to these fish species.

Fuels management

As proposed, mechanical ground disturbing fuels treatments, hazard tree removal, salvage harvest, or commercial fuelwood cutting within RCAs or CARs would be allowed. Silvicultural treatments would also be allowed in riparian areas. Many areas where these fish species are present, or that are important to the recovery of these species, occur within the defense zone of the urban wildland intermix zones. Within these zones, projects providing for public health and safety, such as the felling of hazard trees or fuel reduction activities could reduce upland and riparian vegetation. In addition, prescribed fire could occur in riparian areas occupied by listed species. The reduction of vegetation could result in increased erosion, water temperatures, streambank instability, and sediments entering aquatic habitats. See discussion impacts to aquatic habitats from erosion, vegetation use, streambank disturbance, and sedimentation above under the analysis of Grazing.

As proposed, construction of new skid trails or roads for access into RCAs for fuel treatments, salvage harvest, commercial fuelwood cutting, or hazardous tree removal could occur. See discussion impacts to aquatic from roads above under the analysis of Roads.

The proposed action includes a variety of measures if fully implemented, provide for improved habitat conditions for Paiute Cutthroat trout, Lahonton cutthroat trout, Little Kern golden trout Modoc sucker, Lost River sucker, Short-nose sucker, Warner sucker. These measures include implementing relevant recovery actions identified within final recovery plans, as well as all of the standards and guidelines designed to minimize or avoid impacts to these species. Furthermore, all project level activities that may adversely affect these species will be analyzed for consistency with the various goals and strategies of the proposed action and for compliance with the Act. If these project level actions are consistent with the goals outlined in the proposed action then the results would be protective and restorative for Paiute Cutthroat trout, Lahonton cutthroat trout, California golden trout, Little Kern golden trout Modoc sucker, Lost River sucker, Short-nose sucker, Warner sucker.

Effects of the Proposed Action

California red-legged frog

The effects of the proposed action and our determination are evaluated with the assumption that all of the protective measures described in the proposed action are fully implemented or enforced.

Direct effects are the immediate effects on the species or its proposed critical habitat caused by the proposed action and any interrelated or interdependent actions. Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Timber harvesting, construction and reconstruction of roads, fire prescriptions, and the application of toxic chemicals may directly and indirectly adversely affect California red-legged frog or proposed critical habitat for California red-legged frogs.

<u>Timber Harvest</u>

The proposed action includes the harvesting of timber which can result in direct and indirect effects to California red-legged frogs. The actual killing or crushing of an individual frog from harvest machinery or falling timber may occur and is considered a direct effect. Harassment of individual frogs from timber harvest activity (e.g. noise disturbance and ground vibration) within or near habitat may also directly affect the species. Additionally, loss of sheltering habitat may occur through the harvesting of windblown logs; these logs may be providing sheltering habitat for frogs.

Indirect effects may occur as a result of the loss of riparian and upland vegetation. This, in turn, could effect sedimentation rates into streams, change the microclimate in the riparian and upland environment, increase intensity or alter timing of peak stream flows, alter geomorphology of fluvial systems, increase predation rates, decrease the amount of woody debris, and fragment suitable habitat.

Timber harvesting affects both the physical and biological processes and elements that create and maintain habitat for the California red-legged frog and other aquatic species. These elements include in-stream components such as woody debris (pool building function), water quality and quantity, and instream habitat; and riparian components such as microclimate, leaf litter, shade, prey base, woody debris delivery, and sheltering habitat. Disturbance of any of these components beyond the natural disturbance regime may alter habitat beyond what is suitable for the California red-legged frog.

Timber harvesting can change the hydrologic, sediment, and channel processes within stream systems (Chamberlin et al. 1991). Hydrologic processes may be affected when harvesting significantly alters the water balance in a stream system or by affecting the rate at which water moves from the upland areas to the stream channel. Such changes can, in turn, affect the quantity and quality of California red-legged frog habitat.

The degree to which harvesting activities may affect sedimentation processes varies with geology, climate, vegetation, and land uses (Anderson 1971). Timber harvest activities that leave bare, compacted soil can contribute large quantities of fine sediments to stream channels (Chamberlin et al. 1991) and can increase the frequency of mass soil movements (Rood 1984). Sediment deposition and aggradation within aquatic systems are "normal" functions of a stream, however, timber harvesting directly affects these processes when the supply of sediment increases or decreases (Megahan 1982). Changes in the natural sedimentation processes can alter the water quality within a stream, fill pools utilized by frogs, and possibly smother eggs or larvae.

Timber harvesting can also alter channel structure. Harvesting can change the structure of the stream channels by removing the supply of large woody debris, important in pool formation, and destabilizing banks by removing vegetation. Streams in which structural elements have been removed or altered have generally degraded (Chamberlin et al. 1991). More energy is released when the "steps" are removed from a stream profile, resulting in a simpler, higher-gradient channel with poorer habitat for aquatic species. Eddies and side channels, which may provide habitat for California red-legged frogs, can also be strongly influenced by the loss of in-stream structural elements.

Riparian areas provide sheltering and dispersal habitat for California red-legged frogs. Timber harvesting within or adjacent to riparian areas can alter various riparian processes important to the species. Alterations to riparian habitat can also, in turn, impact aquatic resources. Changes in soil and air temperature, soil moisture, relative humidity, wind speed, and radiation may occur from harvesting adjacent to riparian areas. Excessive changes in microclimate may lead to loss of both aquatic and sheltering habitat. These changes may also cause a decline in aquatic invertebrates and other prey for California red-legged frogs.

Road Construction and Maintenance

The road construction, reconstruction, and obliteration activities proposed by the Forests can directly and indirectly affect the California red-legged frog. Rarely can roads be built that have no negative effects on streams (Furniss et al. 1991). Roads accelerate erosional processes in watersheds and modify natural drainage networks. Frogs could be crushed or killed during construction activities. As riparian habitat is converted to roadbed, the loss of habitat from the actual road footprint may also directly affect frogs. The clearing of vegetation associated with road construction and reconstruction may destroy sheltering habitat.

Roads can affect watercourses by accelerating erosion and sediment loading, by altering channel morphology, and by changing the runoff characteristics of watersheds (Furniss et al. 1991). These affects are similar to the effects described above under the discussion on timber harvesting.

Poorly maintained roads, incorrectly placed or sized culverts, or roads constructed on unstable ground can all contribute massive quantities of sediment into a watercourse. King and Tennyson (1984) found that the hydrologic regime of small watersheds were altered when as little as 3.9 percent of the watershed was covered with roads. Roads can alter hillslope drainage patterns, diverting and channelizing the flow of water. Hauge et al. (1979) discussed how roads can change infiltration rates, interception and diversion of subsurface flow, and timing and distribution of water yield into channels. In-stream road crossings and culverts may change the hydrology of a stream, increasing the velocity and slope, resulting in a loss of aquatic habitat.

The potential of chemical contamination increases with increased road density. Oil dripping from a logging truck as it crosses a watercourse could result in chronic contamination of the stream. Chemicals used to suppress dust, stabilize, or de-ice road surfaces can enter watercourses directly or be transported by runoff (Furniss et al. 1991). Frogs migrating across roads may be crushed or killed by vehicular traffic. Roads provide increased access for humans who may potentially harm or harass California red-legged frogs or intoduce nonnative predators such as bullfrogs or warmwater fish species. Water collection for dust abatement can de-water pools and streams for brief periods.

The BMPs established for road work should minimize indirect effects to the species.

Fuels Treatment

The proposed action includes the use of fire to reduce the abundance of fuels. These activities may directly and indirectly affect the California red-legged frog and its habitat. Burning can increase sediment production in streams if buffer strips are not maintained (Chamberlin et al. 1991). Annual water yields can be significantly increased after fire due to the reduction of transpiring vegetation (Agee 1993). Various erosional processes may be altered by fires (McNabb and Swanson 1990). On the other hand, fire is a natural process that has been historically suppressed, creating crowded, unhealthy forests. The fuels reduction activities proposed within the FEIS may reduce the chances of massive habitat loss through catastrophic, high severity fire.

Direct effects to California red-legged frog from the proposed fuels reduction activities include the loss of sheltering habitat from burning and mastication activities, harassment or killing frogs during the construction of slash piles, and harassment, wounding, or killing frogs during burning activities. Slash piles are usually formed then left until the wet season before they are burned. As soon as the rains begin every fall, California red-legged frogs can travel up to a mile from suitable aquatic habitat. Sheltering in cool, damp upland locations, such as slash piles, may occur. Frogs that take shelter in slash piles may be wounded or killed during the burning of these piles.

Indirect affects to California red-legged frogs include changes in overland water flow, increases in sedimentation into streams, and changes in a drainage's overall water yield. The elimination of streamside vegetation, which may occur if fires do not die down within the moister riparian areas, may increase the California red-legged frog's vulnerability to predators. Finally, during prescribed burns, there is always a possibility for fires to escape and become wildfires.

<u>Forest Chemicals</u>

The proposed project includes the use of pesticides to eradicate noxious weeds as well as to conduct reforestation activities. The Forests will use a variety of herbicides including glyphosate and triclopyr. These two chemicals have variable toxicity to aquatic species and may affect California red-legged frogs in different ways.

Glyphosate is considered to be slightly toxic to aquatic and terrestrial organisms (J. Sefchick, Service, in litt., 1993). The toxicity may depend upon the surfactant used in the formulated herbicide. Bidwell and Gorrie (1995) found that the LC_{50} for tadpoles (*Litoria moorei*) was 11.6 mg/L for the commercial formulation Roundup while the LC_{50} for glyphosate alone was 121.5 mg/L. Toxicity ratings between 10 and 100 mg/L are considered slightly toxic, while ratings between 100 and 1000 mg/L are believed to be practically nontoxic (USFWS 1984). Bidwell and Gorrie (1995) further observed that juvenile amphibians were slightly more resistant to Roundup, but less resistant to glyphosate alone. The Service is not aware of any studies comparing the toxicity of the different surfactants used with glyphosate. Glyphosate is highly soluble in water and is strongly absorbed in soil. Studies referenced in Norris et al. (1991) indicated that glyphosate will persist in foliage and litter for 10 to 27 days and in soil from 28 to 40 days (50 percent remaining). Glyphosate does not bioaccumulate (Folmar et al. 1979) and it does not leach out of soils (Rueppel et al. 1977).

The vulnerability of aquatic organisms to doses of the herbicide triclopyr varies depending on the formulation. Unformulated triclopyr was found to be practically nontoxic to fish (cited in Norris et al. 1991). The triethylamine salt formulation of triclopyr (Garlon 3A) is nontoxic (Berrill et al. 1994) to slightly toxic (cited in Norris et al. 1991) for fish. The more effective triclopyr herbicide Garlon 4, a butoxyethyl ester, is highly toxic, with an LC_{50} of 0.74-0.87 mg/L for fish (cited in Norris et al. 1991). Ratings of toxicity between 0.1 and 1 mg/L are considered to be highly toxic (USFWS 1984). Berrill et al. (1994) concluded that ranid tadpoles may be paralyzed or killed as a result of the use of the ester formulation of triclopyr in forest management. The Forests did not specify which formulation of triclopyr they will be applying.

Direct impacts to California red-legged frogs may occur from herbicide applications within the riparian area all year and outside of the riparian area during the wet season. The risk of individual frogs being directly effected by herbicide treatments depends on the toxicity of the chemical and the likelihood of a frog being exposed (Norris et al. 1991). Impacts from applications of glyphosate should be less than the impacts from triclopyr applications. Direct effects may occur if an adult or juvenile frog is sprayed during application or comes in contact with chemical residue on foliage or litter. Frogs may be harmed or harassed by the pesticide crew during the application process. Herbicide applications may alter the terrestrial vegetation and invertebrate communities on which California red-legged frogs depend. Pesticides may enter watercourses, impacting water quality and California red-legged frog habitat, and affecting egg and tadpole viability. The potential effects of pesticides on California red-legged frog aquatic habitat should be minimized by proposed buffers around riparian and wetland areas (50-foot buffers). The BMPs that direct the transportation, mixing, and application of Forest chemicals should minimize the effects of chemical treatments on California red-legged frog and its habitat.

Activities described within the proposed action could occur in areas proposed as critical habitat for red-legged frogs. Activities such as timber harvests, road construction and maintanence, fuel treatments, and the use of forest pesticides could not occur unless they are consistent with the standards and guidelines for red-legged frogs, riparian conservation areas, and critical aquatic refuges. Furthermore, these actions would be analyzed at the project level to ensure that the primary constituent elements of proposed critical habitat for California red-legged frogs would be sufficiently minimized.

Summary

The action area is located within and around the three remaining known red-legged frog populations in the Sierra Nevada Foothills Recovery Unit. Hydrological changes due to improper grazing, mechanical treatment, prescribed fire, road maintenance, recreation use and other proposed and ongoing activities will occur. Exotic species such as bullfrogs will continually immigrate to the area threatening several of the remaining breeding ponds found within the recovery unit. The most significant impacts to red-legged frogs will be associated with the lack of suitable habitat due to the presence of exotic species and/or degradation of habitat. The loss of red-legged frog habitat and the abundance of nonnative species has led to the isolation of the remaining red-legged frogs within this Recovery Unit. Watershed analysis within CARs and not implementing activities in areas identified as essential (e.g., Core Areas per the Recovery Plan) should help minimize these effects. Watershed analysis will require consideration of the direct and indirect impacts of proposed and ongoing activities that may affect red-legged frogs.

Conservation Measures

In order to minimize direct impacts to red-legged frogs, the Preferred Alternative requires the identification and treatment of habitat bottlenecks and barriers to movement. Project-level analysis includes consideration of general forest linkages and incorporates various standards and guidelines in Riparian Conservation Areas and Critical Aquatic Refuges (CARs) to minimize direct and indirect impacts to red-legged frogs. The requirement that watershed analysis be conducted for watersheds identified as CARs or determined to be essential (e.g., identified in the Recovery Plan) would have beneficial direct impacts. Watershed analysis will result in consideration of project impacts upon red-legged frogs and the possible development of restoration activities. In order to minimize impacts associated with grazing, Aquatic Conservation Strategy goals have been established. Standards and guidelines would limit the amount of forage utilization, as well as encourage the exclusion of animals from the riparian areas. In addition, the preferred alternative will allow managers to rest an allotment when it is determined bo be in a degraded condition. Other standards and guidelines that will minimize impacts to frogs include Roads along streams would be a priority for decommissioning.

Effects of the Proposed Action

Mountain yellow-legged frog

The proposed project could have both positive and negative effects to the mountain yellow-legged frog. The project mandates the creation and implementation of a mountain yellow-legged frog conservation strategy. Within the conservation strategy, the Forest Service, in cooperation with the California Department of Fish and Game would evaluate the need to continue fish stocking practices with the range of the frog. In addition, they would assess the need to remove non-native fish from key lakes and watersheds in mountain yellow-legged frog habitat. These proposed actions, if they were implemented in a timely manner and resulted in elimination of fish stocking and removal of nonnative fish from key watersheds within the frog's historic ranges could help stabilize this declining species.

The project's standards and guidelines provide some additional protection for the mountain yellow-legged frog through the establishment of riparian conservation areas around perennial and seasonal streams and special aquatic features. However, there are very few places where mountain yellow-legged frogs are threatened by mechanical ground disturbing activities.

Potential negative effects from the project could be attributed to continued livestock grazing and recreational impacts in occupied mountain yellow-legged frog habitat. Livestock grazing and the use of packstock and saddle stock, can negatively impact frog habitats through the following means: (1) direct trampling and removal of riparian and wetland vegetation used for cover and egg laying sites; (2) altering the hydrology of streams and lakes which constitute mountain yellow-legged frog breeding habitat; (3) increase siltation of breeding sites; (4) contributing pollutants into breeding habitat through excess nitrogen input resulting in increased levels of aquatic bacteria; and (5) reestablish nonnative game fish by unconcerned individuals. For a more through discussion of potential effects of livestock grazing on aquatic dependent species, see the listed fish species Grazing Effects section.

Impacts could result from the application of pesticides (primarily herbicides) in or adjacent to mountain yellow-legged frog habitat as only areas known to be occupied by yellow-legged frogs (or other threatened, endangered, or sensitive species) will be avoided. Direct impacts including mortality, morbidity, predation (due to lack of cover), and loss of prey species could be associated with the use of pesticides, their derivatives, or their dispersants.

Effects of the Proposed Action

Yosemite toad

Implementation of the proposed project will result in continued livestock grazing and indirect impacts attributed to recreation from associated pack stock. Livestock and pack stock can impact Yosemite toad habitat through a number of means: (1) direct trampling and removal of streamside vegetation which is important for cover and egg laying; (2) altering of wetland hydrology by increasing stream erosion which can decrease the inundation period of ephemeral breeding ponds; (3) increase siltation of breeding ponds; (4) contributing pollutants into breeding habitat through excess nitrogen input resulting in increased levels of aquatic bacteria; and (5) direct trampling of rodent burrows and other nocturnal refugial habitats. For a more through discussion of potential effects of livestock grazing on aquatic dependent species, see the listed fish species Grazing Effects section.

Proper implementation of Standard and Guideline RC-41 may prevent many of the direct impacts attributed by livestock grazing on Yosemite toads and their breeding habitat. However, without total exclusion of livestock grazing from Yosemite toad RCAs, the continued degradation of adjacent upland habitats may continue to occur. This can lead to the introduction of sediment and pollutants into toad breeding sites and the continued trampling of upland refugial habitats and dispersing cover for juvenile and adult toads. Allowing livestock to enter Yosemite toad breeding habitat even after toads have dispersed, may lead to the alteration of meadow, stream and spring hydrology which could preclude future breeding opportunities. Less stringent standard and guidelines in unoccupied habitat will limit the possibilities of populations reestablishing in historically occupied areas.

Impacts could result from the application of pesticides (primarily herbicides) in or adjacent to Yosemite toad habitat as only areas known to be occupied by toads (or other threatened, endangered, or sensitive species) will be avoided. Direct impacts including mortality, morbidity, predation (due to lack of cover), and loss of prey species could be associated with the use of pesticides, their derivatives, or their dispersants.

The project's standards and guidelines provide some additional protection for the Yosemite toad through the establishment of riparian conservation areas around perennial and seasonal streams and special aquatic features. However, there are very few places where Yosemite toads are threatened by mechanical ground disturbing activities.

Effects of the Proposed Action

Bald eagle

Potential direct effects on the bald eagle resulting from resource management activities includes modification, degradation, and loss of habitat or habitat components (primarily large trees, snags, and other perches) and behavioral disturbance to nesting eagles from vegetation treatment (approximately 25,252 acres would be treated annually with prescribed fire and another 68,928 acres with mechanical treatments), facilities maintenance (to include roads), recreation, or other associated activities within occupied habitat, which could prevent or inhibit nesting or lead to nest failure.
The focus of vegetation treatments is in the mid-elevation mixed conifer and eastside pine forest types. Understory stands can be much younger, denser stands than the overstory in bald eagle nest stands. Fuels hazard and risk reduction, either mechanical treatment, underburning or both could substantially change the stand characteristics and have the potential of damaging the nest tree. In addition, snags used as perch trees may be lost to the treatment of fuels.

The normal window for prescribed fire would be in the later part of spring as the snow melts and fuels begin to dry or in the fall months after sufficient rainfall has occurred. In bald eagle territories, prescribed burns in the spring may have a more pronounced negative impact to bald eagle nesting success than would fall burns. Smoke from prescribed spring burns could potentially have negative impacts on nesting bald eagles whereas fall burns are less likely to have adversely affect nesting bald eagles.

Managed natural fires, prescribed underburns, thinning and/or combinations of these can lead to the loss of both habitat or habitat components as these actions are intended to reduce the accumulation of standing, dead, and down woody fuel material. There is a potential for prescribed burns to escape out of control and consume nests, roosts, and perches. The loss of a bald eagle nest to fire would be the most detrimental scenario for bald eagle reproductive success. Prescribed fire and/or thinning will reduce the pretreatment crown closure and change the mean stand diameter. In addition, prescribed fires may result in the loss of large tree components because these trees have heavy accumulation of bark and duff at their base, allowing for even low intensity fires to burn and smolder for long periods, killing cambium tissue (Laudenslayer pers com 2000).

Wildland fires and fire suppression activities can also negatively impact bald eagles through the loss of both habitat or habitat components. Wildland fires can consume nests, roosts, and perches resulting in a reduction in bald eagle reproductive and foraging success. Fire suppression activities, such as helicopter or airplane disturbances and fire breaks may also have negative impacts to nesting and non-nesting bald eagles.

The Preferred Alternative proposes to increase the amount of old forest attributes across the forest landscape. The desired future condition maintains a large tree component through the retention of all large trees greater than 30 inches dbh not posing a public safety hazard. In addition, there will be sufficient quantities of medium size tree to ensure recruitment of and perpetuation of large trees across the landscape where capable. The change in CWHR strata for large trees is a 46.6 percent increase. However, it must be noted that there is a decrease in the CWHR strata 6 (multi-layered stands). These types of stands tend to be favored by bald eagle for both nesting and winter roost. A decrease in the preferred bald eagle nesting and roosting strata will force bald eagles to use stands with more marginal habitat characteristics, possibly further from foraging areas and/or to nest sites in stands without commanding views of water bodies supporting a food base. Forcing bald eagles into marginal stands and/or stands further from the food base will likely require higher energy expenditures of bald eagles occupying such areas. Such effects may result in a reduction in the level of individual bald eagle fitness and reproductive success.

A high percentage of bald eagle nest territories lie adjacent to lakes or reservoirs receiving moderate to high recreational use. Those bodies of water not subject to winter freeze receive low to moderate recreational use even during the winter months. Human disturbance is an important factor affecting bald eagles. Potential negative direct effects to bald eagles in and around lakes and reservoirs include: noise and disturbances created by boating activities including houseboats, water and jet skiing; campground activities; shoreline activities (picnicking and fishing); the construction, maintenance, and use of hiking, biking and vehicle trails and roads; low flying aircraft; discharge of firearms; timber operations and underburns; placement, maintenance and use of portable toilets (both land and floating toilets); barging, stockpiling and burning floating wood debris; and the routine operation and maintenance of reservoirs. High human use on lakes or lakes at lower lake levels with a high concentration of boats, can prevent eagles from foraging in certain areas (Detrich and Santalo 1994). Kristan and Golightly (1995) reported that Shasta Lake bald eagles foraged less often where boat densities were higher. Bald eagle nest success may be adversely affected at lakes with heavy boat use within 0.5 mile of a nest. Where human activity repeatedly flushes bald eagles from foraging or roosting perches a reduction in the level of fitness may result. This in turn may impact nesting success.

One objective of the Aquatic Conservation Strategy is to “maintain and restore the physical structure and condition of stream banks and shorelines to minimize erosion and sustain desired habitat diversity.” However, the habitat around high use recreational areas will be maintained only when human safety is not compromised. The removal of perceived and real hazard trees may limit the availability of day and night roosts and foraging perches for bald eagles. This is likely to have negative impacts to bald eagles resulting in a reduction in the level of individual bald eagle fitness.

Indirect effects

Indirect effects to bald eagles resulting from the proposed action are likely to impact the bald eagles' prey base including fish and waterfowl. Limitations to access and/or availability of prey may result in a reduced level of fitness and reproductive success of individual bald eagles.

Grazing in riparian areas and near the lakeshore of reservoirs and natural bodies of water may negatively impact nesting habitat for waterfowl, an important bald eagle prey item. Improper management of grazing (e.g., overgrazing riparian and meadow areas) can lead to a reduction of shade and cover, changes in stream channel morphology and hydrology, and the addition of sediment due to bank degradation and offsite soil erosion which may all have potential adverse effects on the breeding and feeding habitats of waterfowl. The improper management of grazing may also impact fish habitat and the availability of fish as a bald eagle prey item.

The proposed action includes a variety of measures if fully implemented, provide for improved habitat conditions for bald eagles. These measures include implementing relevant recovery actions identified within final recovery plans, as well as all of the standards and guidelines designed to minimize or avoid impacts to bald eagles. Furthermore, all project level activities that may adversely affect bald eagles will be analyzed for consistency with the various goals and strategies of the proposed action and for compliance with the Act. If these project level actions are consistent with the goals outlined in the proposed action then the results would be protective and restorative for bald eagles.

Effects of the Proposed Action

California Condor

California condors nest in various types of rock formations and in the cavities of giant sequoia trees (*Sequoia gigantea*) (Service 1996). The last breeding pair of California condors taken from the wild nested in a giant sequoia on the Sequoia National Forest within the recently designated Giant Sequoia National Monument. Potential direct effects to California condor from resource management activities includes modification or loss of breeding and roosting habitat from the implementation of fire and fuel management activities.

The theme for the Preferred Alternative is to increase the amount of old forest attributes across the forest landscape. The desired future condition maintains a large tree component through the retention of all large trees greater than 30 inches dbh. However, larger sized tree and snags can be removed if they pose a threat to public safety. The removal of larger giant sequoia trees and snags could result in the loss of future breeding and roosting habitat for the condor.

Managed natural fires, prescribed underburns, thinning and/or combinations of these can lead to the loss of both habitat or habitat components as these actions are intended to reduce the accumulation of fuels, both standing and dead and down woody material. There is a potential for prescribed burns to escape out of control and consume condor nests, roosts, or perches trees.

The proposed action includes a variety of measures if fully implemented, provide for improved habitat conditions for California condors. These measures include implementing relevant recovery actions identified within final recovery plans, as well as all of the standards and guidelines designed to minimize or avoid impacts to California condors. Furthermore, all project level activities that may adversely affect California condors will be analyzed for consistency with the various goals and strategies of the proposed action and for compliance with the Act. If these project level actions are consistent with the goals outlined in the proposed action then the results would be protective and restorative for California condors.

Effects of the Proposed Action

California spotted owl

The proposed action establishes several allocations specifically for the protection of spotted owls and spotted owl habitat. These include a Protected Activity Center (PAC) incorporating 300 acres of the best available habitat around each owl activity center, and a home range core area of varying size (2,400 acres on the Hat Creek and Eagle Lake Ranger Districts of the Lassen National Forest; 1,000 acres on the Almanor Ranger District of the Lassen National Forest, and on the Modoc, Inyo, Plumas, Tahoe, Eldorado, and Stanislaus National Forests, and 600 acres on the Sequoia and Sierra National Forests) representing the most heavily used areas around the activity center. More generalized protection is provided by the establishment of Old Forest Emphasis (OFE) areas totaling 3,123,541 acres (of which about 70 percent is currently spotted owl habitat) within the seven national forests on which 99 percent of the owl sites are located, and by the additional protection of all stands of higher quality foraging habitat, represented by WHR class 5M, 5D, and 6. Overall, the extent of area treated would not exceed 40 percent of the landscape outside the inner urban defense zone (area within 0.25 miles of communities or developments, see S&G FW-F05E).

In all management allocations except the inner urban defense zone, PACs would receive fuels treatment limited to prescribed fire that results in minimal effects to nesting habitat (see S&G FW-RX15A). Home range core areas could receive only prescribed fire or low-intensity mechanical treatments where cores occur in OFE, general forest, and those areas of the threat zone (area up to 1.5 miles from communities or developments) where the amount of suitable habitat does not meet a standard quantity (see S&G FW-RX21A through 21F). In OFE outside the urban zones and outside PACs and cores, treatment would be also be confined to RX21.

Thus, the heaviest effects of the action on spotted owls would be focused in the following areas: 1) in the inner urban defense zone, where PACs could receive RX31, and where core areas and more distant foraging habitat could receive more intensive treatment such as RX55; 2) the outer urban threat zone, where WHR 4D and 4M stands in OFE and in core areas in home ranges that exceed a habitat quantity standard could be treated with RX31, and other core areas and foraging habitat could receive only RX21 or lower; and 3) in general forest, WHR 4D and 4M owl habitat outside PACs and core areas, which could be treated with RX31. The potential for effects of these treatments is further discussed below.

The FEIS demonstrated that four percent of spotted owl activity centers occur within the defense zone of the urban intermix. An additional 32 percent of owl sites occur within the threat zone of the urban intermix, and the remaining 64 percent of owl sites occur outside urban zones. Forty-nine percent of the owl sites outside urban zones occur in allocations where management activities are expected to have minimal impacts on spotted owls and their habitat (RX21 and lighter treatments).

According to a database of treatments projected to occur over the next 20 years provided to the Service by the Forest Service (Preferred Alternative Treatment Pivot Table, Version 5 12/21/00, unpublished database compiled by Stephen N. Hayes USDA Forest Service), 181,511 acres of prescribed fire (RX11 and 15) and 990,087 acres of mechanical treatment (RX21 and above) for a total of 1,171,598 acres of vegetation treatment in CWHR 4M, 4D, 5M, 5D, and 6 stands would occur on the seven national forests comprising 99 percent of the known spotted owl sites on national forests in the Sierra Nevada. This equates to approximately 30 percent of the spotted owl habitat in these age classes. It should be noted that these figures are probably an overestimate of the acres treated because it is uncertain if treatment acres included areas receiving multiple treatments. According to this database, mechanical treatments using RX30 and heavier (treatments that remove trees 20-30 inches) would be used on 325,619 acres, or approximately 8 percent of the current owl habitat in these classes. These prescriptions have the potential to degrade suitable owl habitat by removing relatively larger trees and opening canopy by up to 20 percent increments as the table below from the FEIS indicates.

Likelihood (high, moderate, low) of retaining important structural attributes of spotted owl habitat following vegetation treatment prescriptions projected in the alternatives.

Treatment Type (prescription #)	**>70 percent canopy cover**	**>50 percent canopy cover**	**Two or more Canopy layers**	**>24" average DBH of overstory trees**	**>11"average DBH of Overstory trees**
Prescribed fire (11&15)	High	High	High	High	High
Biomass thin (21)	High	High	High	High	High
Light thin (31&35)	Moderate	High	High	High	High
Heavy thin (45, 51,55)	Low	Low	Moderate	Moderate	High
Group selection Shelterwood/regen (61, 71&81)	Low	Low	Low	Low	Low

According to the database, mechanical treatments will treat 25 percent of the 4M, 4D, 5M, 5D, and 6 stands overall. However, these treatments will not be equally distributed among the forests. Mechanical treatments will disproportionately occur on the Lassen, Plumas, and Tahoe forests (forests comprising the QLG pilot project area) where 31, 28, and 31 percent, respectively, of the CWHR stands above will be treated per forest. All other forests are projected to receive 21 percent or less mechanical treatment in these stands. The forests comprising the QLG project area account for 50 percent of the suitable habitat in the CWHR classes above. Of all the mechanical treatment projected to occur on national forests in the Sierra Nevada in the next 20 years, 60 percent of it will occur on the QLG forests. Due to the QLG pilot project, this treatment is likely to be relatively heavy in the first few years of implementation of the Framework EIS.

Percent of CWHR stands 4M, 4D, 5M, 5D, and 6 projected to be treated mechanically in 20 years.

Forest	**Percent mechanical treatment**
Eldorado	20
Lassen	31
Plumas	28
Sequoia	17
Sierra	21
Stanislaus	20
Tahoe	31

Size and Structure of Vegetation

Major factors of concern pertaining to timber harvest in habitats of California spotted owls in the Sierra Nevada identified by Verner et al. (1992a) included: (1) decline in abundance of very large, old trees; (2) long recovery period for spotted owl habitat after logging; (3) loss of large-diameter logs from the decaying wood source on the ground; and (4) decline in snag density. Of these concerns, significant changes in diameter distributions of trees in the Sierra Nevada and rapid reductions in the distribution and abundance of large, old, and decadent trees were believed to pose the greatest threat to the California spotted owl. According to the FEIS, the diameter of nest trees selected by owls is significantly greater than the average diameters of conifers in the Sierra Nevada. Large trees suitable for owl nesting contribute to the overall quality of owl habitat and become large snags and large downed logs, which are also important habitat attributes for some spotted owl prey species. The length of time required to recruit old trees and increase their density over the landscape raises the level of concern associated with their decline. Blakesley and Noon (2000) argued that the most positive step that can be taken to reverse apparent declines is to increase retention and recruitment of large trees and closed-canopy conditions throughout the Sierra Nevada.

The selected alternative protects large trees by retaining all trees greater than 30 inches dbh in westside forests and all trees greater than 24 inches dbh in eastside forests. It also has a 12-inch dbh size limit in most vegetation treatments in spotted owl core areas, OFE , and CWHR stands 5M, 5D, and 6 and a 20-inch limit in all treatments in suitable habitat outside the defense zone. Thus the alternative specifically retains the 20- to 30- inch size class for future recruitment of large trees in these allocations. The selected alternative also requires retention of the 4 largest snags per acre in mixed conifer habitat and the 6 largest snags per acre in red fir habitats outside of the defense zone, values within the range of the mean values for snag basal area reported by Verner et al. (1992). Retention levels in allocations such as PACs and OFE exceed these retention levels. Due to direction to remove snags for safety concerns and the unpredictable effect of prescribed burns on snags and downed logs, however, it is uncertain as to whether desired conditions for snags and logs will be met after vegetation treatments.

The owl strategy proposed in the FEIS assumes the four percent of the owl sites in the defense zone will be rendered unsuitable by mechanical treatments to manage fire and fuels in that zone. Treatments in PACs (outside of a 500-foot buffer) in these areas will use RX31, which removes up to 20 inch trees and reduces canopy cover by more than 20 percent increments (but resulting in no less than 50 percent total canopy cover where it exists in suitable habitat). Treatments outside of PACs in this area will remove up to 30-inch trees and reduce canopy below the 40-50 percent suitability threshold for California spotted owls. As a result, according to the FEIS, the stands treated with these prescriptions will have a low likelihood of maintaining canopy suitable for nesting (>70 percent) or foraging (>50 percent) habitat in the defense zone. The strategy assumes that sufficient habitat protection in the remaining landscape will be minimally impacted and therefore not only compensate for the loss of habitat in the defense zone, but stop and reverse population declines. Uncertainty exists regarding the validity of this assumption because 50 percent of the owl sites on national forest lands in the Sierra Nevada do not currently have adequate amounts of habitat in their home ranges to likely to support replacement rate reproduction according to the work by Hunsaker et al. (*in press*). The FEIS states that vegetation treatments outside the urban intermix are lower priority.

According to the DEIS, approximately 49 percent of spotted owl sites occur in allocations where RX21 or lighter would be used. These prescriptions would allow the removal of up to 12-inch trees and reduction in canopy cover by increments up to 10 percent (resulting in no less than 50 percent canopy cover where it exists in suitable habitat). It is assumed, but is uncertain that these prescriptions will have minimal impacts on California spotted owls and that these impacts would likely persist for only a short duration until ingrowth re-established canopy cover. According to Verner et al. (1992) and as emphasized in the FEIS, the response of spotted owls and their prey to vegetation treatments remains an area of uncertainty.

In the threat zone of the urban interface (32 percent of owl sites), and in areas outside of spotted owl core areas in the general forest outside of urban areas (presumably 15 percent of owl sites), the use of RX31 could degrade spotted owl habitat through the removal of trees and reduction of canopy cover. This prescription could be used to cut trees 12-20 inches dbh, which have been found to be important components of spotted owl habitat. California spotted owls nest (Bias and Gutierrez 1992) and roost (Moen and Gutierrez 1997) in stands 12-24 inches in diameter. In an analysis of 124 nest sites in the Sierra, 70 percent of the nest trees were greater than 30 inches dbh (Verner et al. 1992). Thus 30 percent were less than 30 inches. Bias and Gutierrez found greater basal area of 12-24 inch trees in nest plots than available in the general landscape. Laymon (1988) found that foraging spotted owls preferentially selected stands 11-44 inches in diameter for foraging and Call (1990) found stands 11-20 inches used for foraging according to their availability on the landscape.

Treatment of owl habitat using RX31 also allows greater canopy cover reduction to occur, which increases the likelihood that suitable nesting habitat (>70 percent canopy closure) could be degraded so that is no longer suitable for nesting. North et al. (2000) found higher reproduction in conifer forest associated with high foliage volumes and concluded: "The possible interaction of weather and nest-site structure on owl reproduction suggests forest managers should be cautious about reducing canopy volume in potential owl nesting areas. Retaining groups of large, old, high crown-volume trees may be needed to maintain the number of potential nesting sites in a forest". As indicated in the FEIS, research on the northern spotted owl (North et al. 1999) found snag volume, foliage volume, and canopy layering to be stand attributes significantly associated with owl foraging intensity. Hunsaker et al. (*in press*) concluded that the threshold between canopy cover values that contribute to or detract from occurrence and productivity of California spotted owls is a value near 50 percent. The selected alternative ensures that outside of the defense zone all vegetation treatments maintain a minimum of 50 percent canopy cover where it exists in suitable habitat. However, suitable habitat should not be assumed to be reduced to threshold levels without adverse effects on the owl population sensu Bart (1995).

The above effects could be expressed in reductions in survival or reproduction rates. According to the FEIS, the impact of RX31 would entail subtle changes in habitat condition and not be expected to result in lower owl densities or lower productivity in owl sites. However, the FEIS also stated that Noon et al. (1992) noted that subtle factors that uniformly decrease habitat quality or increase fragmentation would act to reduce population density and incrementally increase the uncertainties associated with successful dispersal and mate finding. The FEIS also stated that forest management practices that do not provide for retaining groups of large, old, high crown-volume trees may reduce the number of potential owl nesting sites and that vegetation treatments that alter these habitat attributes may influence habitat quality for the California spotted owl. Due to the removal of trees up to 20 inches, removal of canopy in increments up to 20 percent, and the uncertainties associated with the effects of vegetation treatment on owls, using RX31 (rather than 21) increases risks to owls. This is reflected in Table

4.4.2.1i of the FEIS, which recognizes RX31 as providing only a moderate likelihood of maintaining suitable nesting habitat (>70 percent canopy cover).

The increased risk to owls using RX31 is particularly of concern around core areas, which represent the likely areas within the home range receiving concentrated use by territorial owls. It is assumed that these areas provide critical habitat elements for survival and reproduction (such as nest sites, roost sites, access to prey) (Bingham and Noon 1997). Protecting habitat in core areas in the threat zone is important because approximately one-third of the spotted owl sites occur in that area and RX31 is allowed in OFE in this zone (it is generally not allowed in OFE outside of urban zones). If RX31 (rather than 21) is used in core areas in the threat zone, protection of up to 32 percent of the owl sites would not occur to ensure survival and productivity of owls because habitat in these areas could be degraded from suitable nesting habitat to foraging habitat. As a result of this degradation, spotted owls may need to travel further to reach quality habitats and therefore potentially reduce their fitness by increased energetic demands and exposure to potential predators.

Although prescriptions limiting the removal of trees of various size classes may allow recruitment of large diameter trees, recruitment into smaller size classes may be adversely affected in the long term because simple diameter-limit guidelines may not achieve long-term objectives (Franklin and Fites-Kaufmann 1996). The FEIS recognized that the conservation strategy for the California spotted owl in the selected alternative is a short-term strategy. While other project alternatives were projected to have greater increases in owl habitat 50 years in the future, the selected alternative was chosen because it represented the lowest risk to habitat over the first two decades. Retaining existing suitable habitat and improving habitat conditions over the next few decades was recognized as being important for stabilizing owl populations. Research into population dynamics at larger scales has suggested the possible existence of habitat thresholds, below which populations may go extinct in the presence of suitable habitat due to constraints on successful dispersal. With current population declines, vegetation treatment impacts over a short time period may involve risks to the spotted owl population that are not evident by considering longer-term habitat projections alone. In addition, the FEIS noted that shorter-term projections, where the magnitude of change is less influenced by modeling assumptions, may also have lower levels of uncertainty associated with them.

Wildfire

The table below displays the total acres affected from both fuels treatments and wildfire over the next two decades by adding the total acres of projected wildfire to the acres of vegetation treatments that are unlikely to maintain important spotted owl habitat elements.

Total of the projected annual acres of wildfire burned and the estimated annual acres of higher intensity vegetation treatments (in thousands).

First Decade	65
Second Decade	59
Average over Two Decades	62.0

Wildfire effects, particularly those associated with large, stand replacing wildfires, are a major source of risk to spotted owl populations. Loss and degradation of habitat, creation of habitat gaps, and lengthy time periods for habitat reestablishment, are some of the impacts that may result from wildfires. The purpose of vegetation treatments is to affect stand structure to reduce fuel loads and the risk of high severity wildfire, which will in turn affect habitat suitability for owls. Tradeoffs between owl habitat lost through treatments versus projected losses to wildfire events are complex and difficult to assess. The effects of vegetation treatments upon owl habitat are mostly immediate and relatively easy to quantify, but reductions in the acreage and intensity of future wildfires due to vegetation treatments become apparent over longer timeframes. In addition, due to the stochastic nature of wildfire events, wildfire projections have greater amounts of uncertainty and are heavily dependent upon assumptions that are difficult to quantify.

Under the selected alternative, the average annual acres burned in wildfire is projected to remain about constant with current levels over 50 years. The average annual acreage of stand replacing wildlife increases slightly, from about 15,000 acres to about 17,000 acres projected annually at the fifth decade.

The selected alternative prioritizes fuels treatments according to fire risk and proximity to urban zones. It emphasizes fuels vegetation treatments within strategically placed area treatments (SPLATs) in areas of high fire hazard and risk for fuels reduction (often on south and west aspects). Treatment is designed to occur over 30 percent of a watershed area.

Habitat Distribution

Although the conservation strategy for the owl is recognized as a short-term strategy for the reasons discussed above, the FEIS, projected the overall amount of high and moderate suitability spotted owl habitat that would occur on the project area in 50 years. The 50-year projection suggested an approximately 13 percent increase in this habitat as indicated below.

Projected percent changes in the amount of high and moderate suitability spotted owl nesting and foraging habitat from the current to 50 years in the future under the selected alternative.

CWHR Strata

	6	**5D**	**5M**	**4D**	**4M**	**Total**

Current (1000s acres)	1,120	166	662	1,145	1,206	**4,301**
	18.4	454.7	67.3	-39.7	-34.2	**12.8**

As indicated in the FEIS, this broad-scale projection does not ensure that the distribution of this habitat will be sufficient to maintain occupancy or productivity within individual spotted owl sites. Studies have documented a relationship between the proportion of a landscape covered by habitat and the ability of spotted owl pairs in that landscape to survive and reproduce at replacement rates (Bart 1995, Franklin et al. 2000, Hunsaker et al. *in press*). The FEIS acknowledges that given owl population declines, this relationship is particularly important for stabilizing population declines. According to the FEIS, approximately half of the spotted owl home ranges in the Sierra Nevada currently provide the amount of moderate and dense canopy stands (CWHR classes 4M, 4D, 5M, 5D, and 6) found to be associated with higher levels of owl occupancy and productivity by Hunsaker et al (*in press*). As stated in the FEIS, productivity of northern spotted owls increased with habitat and there was no threshold value for habitat at which increases in productivity leveled out. This suggests that removing any suitable habitat (50 percent canopy cover or higher) within the vicinity of the nest tends to reduce the productivity and survivorship of owls (Bart 1995). This also suggests that it should not be assumed that habitat in all home ranges can be reduced to a threshold level without adverse effects on the population.

As reported in the FEIS, average spotted owl home ranges in the northern and southern Sierra Nevada provide higher amounts of habitat than those in the central Sierra Nevada, due in part to more contiguous national forest land. According to the FEIS, increasing the number of owl sites with habitat at and above threshold amount is likely important to stabilizing current population declines in the Sierra Nevada because data indicate that only approximately one half of the owl home ranges currently have these levels of habitat. The conservation strategy for the owl includes OFE , PACs, and owl core areas where vegetation treatments would be limited to prescribed burning or light thinning. Vegetation treatments in these areas are less likely to degrade habitat and therefore provide the best opportunities for maintaining and improving habitat suitability within and surrounding home range areas. Except the defense zone, other allocations throughout the landscape are designed to at least maintain foraging habitat where suitable habitat exists. However, the conservation strategy for the California spotted owl in the selected alternative does not include specific provisions for evaluating or ensuring habitat in individual home ranges. In addition, as indicated in the FEIS, the Forest Service's vegetation inventory based on satellite imagery provides the only large-scale vegetation mapping of spotted owl habitat. As stated in the FEIS, considerable uncertainty remains as to whether this Forest Service vegetation inventory mapping can describe owl habitat with sufficient precision to provide a meaningful description of landscape vegetation characteristics important to the spotted owl.

According to the FEIS, uncertainty also exists regarding how the distribution and abundance of habitat at landscape or regional spatial scales affects connectivity and dispersal among territories. The owl strategy is assumed to provide adequate dispersal habitat because treatment objectives are to maintain at least suitable foraging habitat where suitable habitat exists outside the defense zone. However, there is no specific analysis or requirement to ensure that connectivity of habitat is maintained.

Fragmentation

Franklin et al. (2000) concluded that habitat maintenance is essential when considered on landscape scales because excessive loss of key landscape habitat components, such as mature and old growth forest, can exacerbate the effects of unfavorable climatic conditions on survival. Also, as populations decrease in size, the effects of catastrophes on life-history traits have increasing importance in determining rates of population change (Franklin et al. 2000). Reduction of suitable configurations of nesting, roosting, and foraging habitats in combination with declining populations and unforeseen contingencies (e.g., fire, disease and insect outbreaks, and drought) within spotted owl home ranges could have significant adverse effects on spotted owl population viability.

Work by Franklin et al. (2000) suggested that survival of northern spotted owl adults was related to an optimal mosaic of the amount of suitable interior (> 100m from edge) old growth forest habitat and edge between old-growth and other vegetation types. These habitats buffered the negative effects of climate on adult survival. If similar relationships with interior habitats hold for California spotted owls, the proposed DFPZs and SPLATs could create a level of fragmentation that does not protect sufficient interior old growth forests. Such forests were postulated by Franklin et al. (2000) to allow owls to actively defend an area while avoiding predation, and therefore reduce adult survival.

The potential negative impacts of fragmentation include:

1. Increased edge effects such as encounters with spotted owl predators and/or competitors such as goshawks, great horned owls, and barred owls. (Hamer 1988, Dunbar et al. 1991, Dark et al. 1998).

2. Increases in spotted owl home ranges to compensate for the loss of habitat quality (Carey et al. 1990, Forsman et al. 1984), causing increases in mean nearest neighbor distance and consequent increased risk of predation, additional expenditures of energy (Thomas et al. 1990), and limitations on mate finding and dispersal (Noon and Blakesley 1999).

3. Decreases in occupancy or re-occupancy rates of unoccupied breeding territories (Thomas et al. 1990).

4. Reduction in the available prey base ((Noon and Blakesley 1999).

These effects may be exacerbated in areas of the project area with checkerboard ownership, where timber harvest on private lands has apparently created gaps in the known distribution of spotted owls, and where natural features such as volcanic soils promote forest fragmentation. However, much of the literature on the negative effects of forest fragmentation focuses on the juxtaposition of spotted owl habitat and clearcuts. The proposed action will result in various degrees of fragmentation which will likely result in the juxtaposition of areas of relatively low canopy cover with relatively higher canopy cover and areas with relatively low ground cover with areas of relatively high ground cover. The effect of this “low contrast” fragmentation will be progressively more pronounced as treatments occur from PACs to core areas and OFE to general forest to urban zones. It is difficult to predict whether low contrast fragmentation will result in the negative effects listed above. Studies of northern spotted owls suggest that the effects may not be as negative. For example, radio marked northern spotted owls traversed their home ranges less in areas of older forest mixed with different seral stages than did owls in areas with similar amounts of older forest mixed with clearcuts (Carey and Peeler 1995).

Franklin et al. (2000) suggested that the juxtaposition of mature forests and other vegetation types actually benefits adult survival (in combination with interior habitat as discussed above) and reproduction, because both of these parameters were associated with increased edges of old-growth and other vegetation types. In this study, edges were thought to provide foraging opportunities where prey are both abundant and accessible. However, the major prey species in Franklin et al.'s study area was the dusky-footed woodrat, which may be abundant in such habitats, but the primary prey species for the California spotted owl in the project area is the northern flying squirrel.

Such relationships may not hold for flying squirrels and the importance of old-growth interior habitat may have greater influence in promoting both adult survival and reproduction of California spotted owls. However, as reported in the FEIS, comparison of demographic data from spotted owls on the Sequoia/Kings Canyon National Parks with those on the Sierra National Forest found that spotted owls on the National Forest averaged slightly higher fecundity but owls on the National Park had slightly higher annual survival. Although the differences were not statistically significant, the general results are consistent with those found in the Franklin et al. study, assuming that habitat on National Forest lands is patchier than that found on National Park lands.

The emphasis of SPLATs over DFPZs, objective of avoiding spotted owl sites when designing SPLATs, and limitation of SPLAT treatment to 30 percent of the landscape as discussed in the FEIS minimizes potential effects of fragmentation to owls. However, DFPZs will be constructed in the defense zone and in the Herger-Feinstein Quincy Library Group (QLG) Forest Recovery Act pilot project area. In addition, SPLATs will encompass large (potentially thousands of acres) areas of forests, predominantly on west and south facing slopes.

Areas of Concern (AOC)

The risk and uncertainty associated with maintaining a well-distributed population of California spotted owls is higher within the geographic areas of concern described by Beck and Gould (1992) as areas A, B, 1, 4, 5, 7, and 8 occurring on the Lassen, Eldorado, Stanislaus, Sierra, and Sequoia National Forests. The authors cautioned that these are areas where management decisions may have a disproportionate potential to affect the spotted owl population. According to the FEIS, given documented population declines, the extent to which the alternative provides sufficient habitat to maintain spotted owl sites within the areas of concern is an important consideration. This is particularly the case in those areas that include checkerboard land ownership patterns, fragmented habitat, or low population densities. A large part of the landscape in these areas may already be deficient in quantities of habitat needed by owls at the home range scale. According to Beck and Gould, management actions in these areas particularly have the potential to disproportionately impact owl sites. The EIS states that with past and continuing habitat alteration on non-federal lands there is little assurance that owl sites will not decline within these areas of concern, increasing nearest neighbor distances and reducing the likelihood for successful dispersal and mate finding.

The selected alternative provides no unique management direction specific to areas of concern, although several standard and guidelines provide assurance that at least some habitat in these areas will be protected. These include standards and guidelines to ensure that for spotted owl sites with activity centers on or off Forest Service land, PACs and core areas will be established and protected on Forest Service lands even where a large proportion of the spotted owl home range occurs on non-Forest Service lands. According to the FEIS, this is particularly important in areas where national forest lands are highly fragmented because providing sufficient habitat to maintain spotted owl occupancy and productivity in such areas may require that all of the available national forest land be managed as suitable spotted owl habitat. In addition, the intent to provide spotted owl habitat across the landscape outside of defense zones should contribute to maintaining habitat for owls in these areas at the home range scale. However, there is no standard and guideline in this alternative to ensure this. According to the FEIS, reducing the amount of habitat within the few home ranges that exceed the habitat threshold, prior to increasing amounts of habitat in other owl home ranges, could increase the risk of worsening conditions and increasing nearest neighbor distances for owl sites within these areas.

As portrayed in the FEIS, in specific geographic areas of concern, the proportion of owl sites in urban zones ranges from 3 percent in AOC 1 on the Lassen National Forest, to as high as 78 percent within AOC 7 on the Sierra National Forest. Areas of concern 5 and 7 have a high proportion (greater than 70 percent) of owl sites occurring within the urban intermix zone, and are therefore likely to be at risk to impacts from vegetation treatments. Areas of Concern 3, 4, and 8 have more than twenty five percent of the known owl activity centers within the urban intermix zone. According to the FEIS, prescriptions using intensive vegetation treatments (such as heavy thinning in the defense zone) present the greatest risk to worsening habitat conditions within areas of concern. As a result, it was assumed in the FEIS that owl activity centers occurring in the urban defense zone may not be maintained through time. This is four percent of spotted owl sites Sierra Nevada-wide; and represents 22 percent of owl sites in AOC 5.

Prey

Although habitat suitability for the main prey items of the spotted owl, northern flying squirrels and dusky-footed woodrats is expected to increase after 50 years, the effects of vegetation treatments on these species are uncertain, as emphasized in the FEIS.

Projected percent changes in overall habitat suitability scores for select prey species of California spotted owls based on CWHR habitat models from the current to 50 years in the future in the selected alternative.

Species Name	**Percent Change**
No. Flying Squirrel	11.9
Dusky-footed woodrat	5.2
Bushy-tailed woodrat	9.0
Western Red-backed vole	10.8
Deer Mouse	1.5
Western Harvest Mouse	215.1
Mountain Pocket Gopher	35.3
Botta's Pocket Gopher	43.6
California Vole	126.6
Montane Vole	178.2
Long-tailed Vole	-5.1
Heather Vole	-4.2
Ornate Shrew	-0.1
Dusky Shrew	5.1
Trowbridge's Shrew	3.2
Vagrant Shrew	1.1
Broad-footed Mole	137.9

For 75 percent of the California spotted owl sites on national forests in the Sierra Nevada, northern flying squirrels are the primary prey species (Verner et al. 1992b). Flying squirrels typically use older mature forest because they provide suitable nest sites, including snags, and abundant sources of food including arboreal lichens and truffles, which are associated with an abundance of soil organic matter and decaying logs (Verner et al. 1992b). The conservation strategy manages conifer forests across the Sierra Nevada for retention of very large and old trees, and emphasizes retention of large snags, and large downed logs in spotted owl PACs and core areas managed to provide optimum habitat for the California spotted owl. However, the proposed thinnings and fuels treatments will remove snags and logs and therefore potential nest sites and food sources of northern flying squirrels. This could consequently potentially reduce the prey base for California spotted owls. Heavy thinning in the defense zone resulting in reductions in forest basal area, especially tall trees, could negatively impact northern flying squirrels (Zeiner et al. 1990; Verner et al. 1992) because this species requires dense forest stands with tall trees for locomotion.

Cattle grazing in Sierra Nevada foothill woodlands may have negative impacts on woodrat populations and on the cover value of the habitat for owls (Verner et al. 1992b), but the effects of grazing on spotted owls remain a research topic to be addressed (Gordon Gould, California Department of Fish and Game, pers. comm., 2000).

Disturbance

Forest management and recreational activities have the potential to disturb spotted owls and therefore adversely affect their survival and reproduction. Habitat disturbance surrounding activity centers is minimized in the selected alternative with the use of limited operating periods within 0.25 mile of nesting of potentially nesting owls in the breeding season. This should protect owls from the physiological stress found to be significantly higher in male owls within versus beyond 0.25 miles from a recent timber harvest activity by Wasser et al. (1997). Wasser et al. also found stress levels to be higher in owls within 0.25 miles of a major logging road. Although the decommissioning of roads is proposed as part of the selected alternative, this task will not be immediately completed and will therefore continue to be a potential impact to spotted owls. The effect of recreation on owls is poorly understood, but was identified as an increasing threat to California spotted owls, especially in southern California (Noon and McKelvey 1992). The conservation strategy affords some protection to California spotted owls from potential adverse effects of recreation by requiring the limited operating period. However, as indicated in standard and guideline FW-B11A, it does not apply to existing road and trail use or continuing recreation use (which is expected to increase) except where a project is proposed and an analysis determines that such activities are likely to result in nest disturbance. As a result, if spotted owls are disturbed by these activities and they are not in an area where a project is proposed, the disturbance to these owls could continue without measures to avoid or minimize the disturbance.

Cumulative Effects

The petitioners for the California spotted owl petition claimed that timber harvest in national forests included effects to home ranges surrounding PACs in 971 cases, to SOHAs in 185 cases and to individual owl territories in 183 cases. The Forest Service lacks and needs a regional program to track effects to California spotted owls (Verner 1999) and conserve their habitat. The ROD for this FEIS establishes a regional monitoring team and describes the intent to form interagency oversight groups. A logical function of such monitoring and oversight would be to evaluate treatment effects on spotted owls, but this function is not specified.

According to the FEIS, about 2.4 million acres of private lands occur within the Sierra Nevada; of this, about 1.45 million acres are owned and managed as industrial forests, primarily at mid-elevations in the mixed-conifer forest type. National Forests in the Sierra Nevada include approximately 1.4 million acres of private land within their administrative boundaries. Private land inholdings are much greater in extent in the northern National Forests (especially the Lassen, Plumas, and Tahoe) than in the southern Sierra Nevada forests. Much of the private

land within the boundary of the Lassen and Plumas National Forests tends to be in contiguous blocks, leaving National Forest lands also fairly contiguous. Most private land on the Tahoe National Forest is in checkerboard ownership, and the Eldorado National Forest has a combination of checkerboard ownership and large contiguous blocks of inholdings. The Sierra and Sequoia have little private land within their administrative boundaries and the four National Parks have negligible amounts.
Management of industrial forests is governed by the forest practice rules of the Z'berg-Nejedly Forest Practices Act, which provide no specific measures to protect or maintain habitat for California spotted owls and therefore do not provide assurance that activities will retain the amount and quality of habitat expected to maintain spotted owl occupancy or productivity (Bart, 1995, Hunsaker et al. *in press*, Verner et al. 1992). The Petition to List the California spotted owl as a Threatened or Endangered Species (Center for Biological Diversity, Sierra Nevada Forest Protection Campaign, April 2000) reported a total of 299,421 acres of timber harvest on private land planned within two miles of known spotted owl sites. The FEIS reported that timber harvest on private lands has been and will continue to be a major source of cumulative impact upon spotted owl habitat in the Sierra Nevada. According to the FEIS, it is assumed that spotted owl habitat on private lands will continue to decline under current Forest Practices rules.

Human population growth and development in the Sierra Nevada is projected to increase substantially over the next few decades. According to the FEIS, impacts related to increased urbanization, infrastructure development, and recreation, are likely to increase over time. For spotted owls in southern California and the foothills of the Sierra Nevada, urbanization is the primary cause of habitat loss and degradation, especially at low elevations (Gutiérrez 1994). Direct and indirect loss and degradation of habitat of California spotted owls and their prey is expected to continue in these areas through residential development (Laymon 1988, Verner et al. 1992b), harvest of hardwoods for firewood production (Laymon 1988, Verner et al. 1992b), human disturbance, and other consequences of development because these are among the fastest growing areas in California (Laymon 1988, McKelvey and Weatherspoon 1992). Houses and housing developments scattered through otherwise suitable habitat were not found to be occupied by California spotted owls in southern California, although areas adjacent to these developments contained dense and productive populations of the subspecies (Gutiérrez 1994). As a result, development has the potential to further impair effective dispersal among isolated populations (Ruth and Standiford 1994). In the San Bernardino Mountains, development is likely to first occur at low elevations where the owls have been found to be the most productive (LaHaye et al. 1997). Urbanization has similar negative implications for California spotted owls in the Sierra Nevada that migrate to lower elevations in the winter (Laymon 1988, Verner et al. 1992b).

Climate may influence vital rates of spotted owls through direct and indirect means (LaHaye et al. 1994, Verner 1999, Franklin et al. 2000, North et al. (2000), such as its effect on prey populations. In southern California, drought was hypothesized to affect spotted owl population dynamics through its effect on prey (LaHaye et al. 1994). North et al. (2000) found synchronous low reproductive success of owls in the Sierra National Forest and Sequoia/Kings Canyon National Park correlated to high spring precipitation (as found for northern spotted owls by Franklin et al. 2000) and lower spring temperatures, presumably due to effects of weather on prey species. Results of a modeling study conducted by Franklin et al. (2000) suggested that northern spotted owl populations may experience periods of decline solely to climatic variation; i.e., even if habitat conditions remain unchanged, northern spotted owl populations may decline. The synchronous declines in reproduction observed by North et al. (2000) are of concern because as populations decline, the effects of catastrophes, especially those having a synchronous effect on populations, will have an increasing importance in determining rates of population change (Peery 1999, Franklin et al. 2000).

QLG Pilot Project Area

According to the FEIS, the high rates of and types of vegetation treatments occurring over a short duration in the QLG pilot project area as proposed in the QLG EIS would result in substantial risk to the distribution and abundance of California spotted owls and owl habitat in the northern Sierra Nevada. Implementation of vegetation treatments described in Alternative 2 of the HFQLG would increase the amount of discontinuous habitat and habitat isolation through creation of further fragmentation within areas of concern and contribute to further habitat fragmentation within three of these areas (AOCs 1, 2, and 3) where habitat is already discontinuous or naturally fragmented, or where there is little information about owl densities. Such action would be expected to decrease the density of owl pairs making successful dispersal more difficult and reducing the likelihood of rapid colonization of unoccupied habitat by owls. In particular, Area of Concern 1, occupying a large portion of the Lassen National Forest, is an area where habitat fragmentation decreases the density of spotted owl pairs, making successful dispersal more difficult.

The selected alternative was determined in the FEIS as the alternative posing the least risk of reducing the acreage of suitable habitat because it was projected to result in no heavy thinning, group selections, seed tree or regeneration harvest. Table 4.4.2.1i of the FEIS indicated that group selection had a low likelihood of maintaining suitable owl habitat. North et al. (2000) believed group selection, which manages forests in 0.8-ha (2-acre) blocks on a 200-year rotation, would reduce the potential number of nest trees. According to the FEIS, reduction in canopy cover resulting from heavy thinning or group selection harvest would create substantial contrast between treated patches and remaining patches of habitat. Implementing group selection openings would create low to moderate density openings within each stand and would create additional edge adjacent to or within suitable habitat. Implementing DFPZ treatments would maintain continuous cover but would increase the amount of contrast between treated and untreated stands and associated edge. The Biological Evaluation for the HFQLG project concluded that the proposed QLG action increased edge effects, reduced habitat connectivity, and increased habitat gaps. It was rated "low" in minimizing fragmentation. The FEIS noted that implementing group selection in a manner that creates very small, irregularly distributed, low density openings, could minimize fragmentation effects.

The Service assumes that the spotted owl strategy in the FEIS will supercede the management direction for vegetation treatments in the QLG area. As a result, group selections would not be prescribed. However, a proposal to implement an administrative study using group selection on the QLG project area would allow this prescription and its potential negative impacts on spotted owls in the area to occur. The Service also assumes that prescriptions in the owl strategy of this FEIS will apply to the QLG area, e.g., RX21 will apply to DFPZs outside of urban zones where they intersect with spotted owl core areas and OFE. The Service notes that risk to owls in the QLG area will be reduced by overlaying the Framework measures, but risk to spotted owls is relatively higher due to the linear nature of DFPZs, which were not designed with the objectives of the Framework strategy of focusing treatments in areas of high fire risk in urban areas, and the disproportionately higher use of mechanical treatment projected to occur in forests comprising the QLG area.

In summary, fire and fuels treatments used under the conservation strategy for the California spotted owl are assumed to be limited in areal extent. Except in urban defense zones, these treatments would use prescriptions that would, at a minimum, result in post-treatment stand conditions that constitute owl foraging habitat. As a result, potential negative impacts to owls are assumed to be minimal in extent and duration. However, the validity of these assumptions is uncertain primarily because the effects of vegetation treatments on owl habitat are unknown. Despite the fact that the response of spotted owls and their prey to vegetation treatments was identified as a key research need by Verner et al. 1992, this question remains unanswered. The conservation strategy for the California spotted owl developed by the Framework is recognized as a short term strategy and therefore critically relies on the commitment to research and monitoring for filling information gaps that could be used to develop a long term strategy for the owl.

Timber sales and fuels treatments for which a ROD was signed before the Framework ROD followed the CASPO interim guidelines developed by Verner et al. (1992a). These guidelines were intended to maintain management options for the California spotted owl in the short term (maximum of five years Verner 1999) until a conservation strategy for the owl was developed for the long term comprehensive strategy. These guidelines have now been in effect for over eight years. The primary objectives of the interim guidelines were to protect known nest stands, protect large old trees, and reduce the threat of stand-destroying fires. However, they allowed degradation of suitable nesting and roosting habitat by allowing timber harvest (except in PACS and some acreage in SOHAs) to reduce canopy cover to 40 percent in timber types selected by owls and below 40 percent in other types used by owls according to their availability on the landscape. The estimated time of recovery of these treatments was five years.

In its 90-day finding on the petition to list the California spotted owl (65 **FR** 60605) on October 12, 2000, the Service found that listing the California spotted owl may be warranted. In its administrative finding for this decision the Service stated "the Service finds that existing regulatory mechanisms and interim guidelines are inadequate to protect the California spotted owl and its habitat, warranting protection of the subspecies under the [Endangered Species] Act". As a result, timber sales and fuels management projects that are currently being implemented under these guidelines continue to degrade habitat for a species for which listing may be warranted.

Effects of the Proposed Action

Southwestern willow flycatcher

Potential direct effects on the southwestern willow flycatcher include modification or loss of habitat or habitat components (e.g., riparian vegetation) and behavioral disturbance to nesting flycatchers from vegetation treatment, livestock grazing, recreation, or other associated activities within occupied habitat, which could prevent or inhibit nesting or lead to nest failure.

All known occupied breeding habitat on National Forest land is within the South Fork Wildlife Area. There are no vegetation treatments proposed there. Thus, we do not anticipate any direct effects to flycatchers from this activity. However, suitable habitat likely exists in other lower elevation riparian areas of the Southern Sierra Nevada Forests or could develop with the current proposed management strategies. Therefore, impacts to willow flycatchers could occur in other areas during the life of this plan if willow flycatchers recolonize previously unoccupied areas and could be impacted by the variety of activities listed above (vegetation treatments, grazing, recreation) .

Forest Service recreation facilities in or near the South Fork Wildlife Area include 8 developed campgrounds offering more than 800 individual campsites, 6 group camping sites, sites designed for individual with physical disabilities, picnic areas, river/reservoir access points, parking areas, and boat ramps. Recreational activities currently allowed by the Forest include camping, hiking fishing, boating, waterskiing, jet skiing, sailboarding and swimming. High water levels also increase the amount of jet skiers utilizing the wildlife area. The fact that close contact, at high speeds, to breeding habitat is associated with this recreational activity, disturbance and harassment of the birds during the breeding season could occur and this could result in lower reproduction rates. The Forest Service currently works with the Corps and the County to enforce speed limits and access to areas where willow flycatchers are known to nest.

Livestock grazing can result in the direct loss or degradation of habitat. Indirect effects are associated with the effect that permitted livestock grazing has on brown-headed cowbird populations and parasitism rates and on the abundance of prey species utilized by the southwestern willow flycatcher. The Forest has consulted with this office on the permitted grazing in the Isabella/South Fork allotment. However, adjacent allotments may serve as source populations for cowbirds by providing feeding areas near host species' nesting habitats (Hanna 1928, Gaines 1974, Mayfield 1977). Cowbirds may travel almost 7 km (4.2 miles) from feeding sites where livestock congregate to areas where host species are parasitized (Rothstein et al. 1984). Cowbirds lay their eggs in the nests of other songbirds and removes a number of the host's eggs and replaces them with an equal number of cowbird eggs. The host species then incubates the cowbird eggs. Cowbird eggs hatch earlier, they are larger, and they are also more aggressive than the host's young. Cowbird nestlings typically out compete those of the host species for parental care, and, as a result, the host species' own reproduction is reduced or eliminated (Bent 1965, Mcgeen 1972, Mayfield 1977, Harrison 1979, Brittingham and Temple 1983).

The effects of parasitism by brown-headed cowbirds on southwestern willow flycatchers include reducing nest success rate and egg to fledging rate, and delaying successful fledging (because of renesting attempts) (Harris 1991). A common response to parasitism is abandonment of the nest (Holcomb 1972). Willow flycatchers may also respond to parasitism by ejecting cowbird eggs, by burying them with nesting material and renesting on top of them, or by renesting in another nest (Harris et al. 1991). However, the success rate of renesting is often reduced, because these attempts produce fledgling several weeks later than normal, which may not allow them adequate time to prepare for migration (Harris 1991). Renesting also usually consists of smaller clutches, further reducing overall reproductive potential (Holcomb 1974).

Cowbirds are known to be present throughout the South Fork riparian forest and livestock grazing on the Isabella Allotment may create or enhance foraging habitat for them. Currently, cattle are not present on the allotment during the periods southwestern willow flycatchers are present. The proposed action continues this program and should be effective at minimizing the indirect effect that grazing has on cowbird abundance. The Army Corps of Engineers is currently funding a highly successful cowbird trapping program that includes trapping on the adjacent South Fork Wildlife Area. This also is an effective measure for minimizing the indirect effects of grazing.

Critical habitat has been designated on Forest Service lands at the South Fork Wildlife Area within the 100 year flood plain of the South Fork Kern River. The amount of habitat under Forest Service control comprises approximately 33 percent of the total of the critical habitat unit. The proposed activities may result in short term or temporal impacts to the primary constituent elements of critical habitat. We also recognize, that operation of Isabella Reservoir is the overriding factor in determining habitat conditions is this area.

The proposed action includes a variety of measures that should, if fully implemented, provide for improved habitat conditions for the willow flycatcher and its critical habitat. These measures include development of a conservation assessment for the willow flycatcher, implementation of Riparian Conservation Objectives and Standards and Guidelines, Conservation Strategy and Standards and Guidelines specifically for the willow flycatcher, implementation of Aquatic

Management Strategy, and establishment of Riparian Conservation Areas and Critical Aquatic Refuges. Future, site specific activities will be analyzed as they are developed and proposed and would be consistent with the various measures, standards and guidelines, and strategies. If these future proposed site specific actions are consistent with the goals outlined in the proposed action then the results would be protective and restorative for the southwestern willow flycatcher and its critical habitat.

Effects of the Proposed Action

Sierra Nevada bighorn sheep

Potential direct effects to Sierra Nevada bighorn sheep from resource management activities includes modification of habitat or habitat components and direct loss of individuals resulting from activities within or adjacent to occupied habitat, fuel management and grazing, respectively.
Approximately 1,007 acres would be treated annually with prescribed fire and another 200 acres with mechanical treatments on the Inyo National Forest. The focus of these treatments is the mid-elevation mixed conifer and eastside pine forest types. Hazard and risk maps indicate that Sierra Nevada bighorn sheep habitat may not be a high enough priority to warrant additional prescribed fire beyond what has already been accomplished by the Inyo National Forest. The preliminary draft recovery plan recognized the importance of prescribed fire and mechanical treatment in the recovery and long term management of the Sierra Nevada bighorn sheep (Carl Benz, Recovery Team Member, pers. com.).

The normal window for prescribed fire would be in the latter part of spring as the snow melts and fuels begin to dry or in the fall months after sufficient rainfall has occurred; at these times, bighorn sheep have vacated low elevation winter range and are moving into or occupying high elevation summer/fall habitat. Furthermore, at the time of a prescribed burn or mechanical treatment, experienced biologists are present monitoring the presence and movement of bighorn sheep in the area. These biologists provide guidance as to the actual implementation of the prescription. Therefore, neither prescribed fire nor mechanical treatment will result in direct injury to or mortality of bighorn sheep.

Managed natural fire, planned ignition resulting in light underburns, thinning and/or combinations of these tools can lead to the improvement of Sierra Nevada bighorn sheep habitat. These actions can reduce the accumulation of fuels, to include ladder fuels (shrubs and dense stands of small trees) standing dead and down woody material. Managed natural fire and planned ignition can also remove old decadent vegetation and stimulate vigorous, more nutritious bighorn sheep forage. Generally, treated stands tend to be younger denser stands, have a high amount of ladder fuels, have limited use by bighorn sheep, and provide excellent cover for mountain lions. Treating stands in this condition will be benefit Sierra Nevada bighorn sheep in the long term by 1) providing more open stand conditions thus minimizing the cover used by mountain lions when stalking or ambushing prey, and 2) stimulating vigorous, more nutritious forage.

Opening up habitat for the bighorn sheep will encourage movement of bighorn sheep into higher quality habitat areas and minimize predation by mountain lions and other predators. Maintaining preferred movement corridors will facilitate bighorn sheep returning to historic, high quality wintering areas, which are essential for maintaining viable populations of bighorn sheep. Minimizing habitat favoring predation by mountain lions and other predators maximizes annual breeding potential as well as survivorship and recruitment of lambs into the breeding population. Furthermore, providing access to high quality winter forage maximizes bighorn sheep body condition as ewes enter into lambing season, which relates to a healthier condition of lambs at birth and a better condition of the ewes to support the new born lambs.

Livestock grazing/trailing adjacent to the action area may also impact Sierra Nevada bighorn sheep. *Pasteurella haemolytica* is the major pathogen responsible for the death of bighorn sheep after contact with domestic sheep. In both fenced studies and free ranging herds, most contact between bighorn sheep and domestic sheep resulted in pneumonia in bighorn sheep and the death of all or most bighorn sheep while domestic sheep remained healthy. Most grazing allotments depend on existing natural water features to water sheep and use local topography to contain the sheep herds. Some allotments are fenced. Sheep have strayed from allotments and have been found within occupied bighorn sheep habitat. Furthermore, bighorn sheep rams could be attracted to ewes in estrus while on the allotment. To date, the Inyo National Forest has been active at either closing allotments or conditioning allotment use so that there is no reasonable probability that domestic sheep can come into contact with bighorn sheep.

The Inyo National Forest has been an integral partner in the development of a "Draft Interagency Domestic Sheep Management Strategy." This document outlines the evaluation criteria (risk factors) developed and applied by the interagency team to identify the risk of disease transmission between domestic sheep and bighorn sheep for each allotment/lease.

<u>Summary</u>

The action area is located within and around the current and the historic Sierra Nevada bighorn sheep habitat. The most significant impacts to bighorn sheep will be associated with the fuels management and grazing of domestic sheep. The enhancement of bighorn sheep habitat from prescribed burns and mechanical treatment will promote the protection and conservation of the bighorn sheep. The continued management of domestic grazing allotments to minimize the potential for contact between bighorn sheep and domestic sheep is essential for recovery. Grazing management will require adaptive management and consideration of the direct and indirect impacts of proposed and ongoing activities that may affect Sierra Nevada bighorn sheep.

The proposed action includes a variety of measures if fully implemented, provide for improved habitat conditions for Sierra Nevada bighorn sheep. These measures include implementing relevant recovery actions identified within final recovery plans, as well as all of the standards and guidelines designed to minimize or avoid impacts to Sierra Nevada bighorn sheep. Furthermore, all project level activities that may adversely affect Sierra Nevada bighorn sheep will be analyzed for consistency with the various goals and strategies of the proposed action and for compliance with the Act. If these project level actions are consistent with the goals outlined in the proposed action then the results would be protective and restorative for Sierra Nevada bighorn sheep.

Effects of the Proposed Action

Pacific Fisher

The proposed action includes a variety of measures that will, if implemented, provide improved habitat conditions for the Pacific fisher. Specific measures include: (1) the protection of all known fisher natal and maternal den sites, and any located in the future; (2) the creation of buffer around fisher den sites; (3) the minimization of old growth habitat fragmentation; (4) the creation and enhancement of oak regeneration; (4) the maintenance and creation of old growth forest habitat in sufficient locations and connectivity between such habitat to sustain viable fisher populations; (5) the provision of opportunities for the expansion of the fisher population beyond the Southern Sierra Fisher Conservation Area; (6) the prevention of disturbances to protected activity centers and den sites; (7) the avoidance of fisher habitat degradation; (8) the maintenance of suitable fisher habitat throughout the Southern Sierra Fisher Conservation Area; and *9)* a systematic survey for fishers throughout the plan area. In addition, the implementation of the conservation strategy for the California spotted owl is expected to provide habitat for the fisher on a widespread basis across the planning area. Future site specific activities will be analyzed as they are developed and proposed and would be consistent with the various measures, standards and guidelines, and strategies. If these future proposed site specific actions are consistent with the goals outlined in the proposed action and applied across the project area (throughout the former range of the fisher), the results should be protective for the Pacific fisher. However, such future proposed site specific actions may not provide for the expansion of the Pacific fisher because the proposed action will be managed to only specifically provide suitable habitat in their current range.

The Forest Service's desired future conditions for the action area within the current and historic range of the fisher include an increase in fisher populations and habitats and for the Southern Sierra Fisher Conservation Area to expand northward to re-establish connection with the west coast metapopulation. Within each watershed, the desired future condition is to have a minimum of 50 percent of the mature forested area to consist of at least travel/foraging quality Pacific fisher habitat, and at least an additional 20 percent in resting/denning quality habitat. Below is an effects analysis of the proposed action to the Pacific fisher.

Potential direct effects on the Pacific fisher resulting from resource management activities include 1) modification, degradation, and loss of habitat or habitat components (primarily large trees and snags) and 2) behavioral disturbance to denning and foraging Pacific fishers from vegetation treatment and other activities. The most severe habitat modification would primarily occur as result of implementation of intensive fuels management prescriptions in the inner urban Defense zone. While it might be assumed that the presence of human activities may already be inhibiting fisher use of this zone, it should be noted that several known fisher den sites are within this zone in the southern Sierras. Less intensive, but more extensive, habitat modification will occur as prescribed fire and mechanical treatments such as RX 15, 21 and 31 are applied in SPLATs on up to 40 percent of the landscape outside the Defense zone. The primary anticipated effect to fisher habitat would result from the reduction of canopy closure where RX 31 is carried out in WHR 4M and 4D by a component of 20 percent and in some cases down to 50 percent overall. This canopy closure level is below that observed over large areas of fisher home ranges in the southern Sierra. Other impacts may occur to the degree that the number of snags and logs are reduced. The actual degree of impact to fisher is unknown, but perhaps lessened by the fact that the species is apparently currently absent from much of the area where these treatments will occur, and by the expected regrowth and increase in canopy closure in the decades following the treatment.

Disturbance of denning and resting sites could occur during vegetation treatments and other activities such as recreation and during maintenance of roads and facilities. All known den sites will be protected, so the potential for impact to dens depends upon the likelihood that dens can be detected. In general, in the absence of intensive studies, den site detection is difficult and rare, so an unknown degree of disturbance must be anticipated. Provision of abundant habitat components for successful denning is probably the most important measure available to provide for reproductive success.

The systematic survey for fishers that is proposed for implementation within 2 years throughout the action area should be very valuable in further evaluation of the status of the species and in locating areas where additional management focus is appropriate. Any verified detection of a fisher in this study, or any other verified fisher detection, would trigger local project area surveys and habitat evaluations. However, there is no specific direction as to habitat management that would occur following such a detection. Although the existing direction will be helpful in responding to new fisher detections, some possibility remains that undetected fishers will be affected by management activities. This possibility could primarily be reduced by more intensive survey efforts, such as local surveys for all projects. Thus some uncertainty as to effects remains in relation to undetected animals and unspecified management direction in the event of a detection.

When detected, den sites will be protected from March 1 through June 30 with 700 acres consisting of the highest quality, largest, and most contiguous blocks of available fisher habitat. Birthing and rearing sites will be protected and maintained at California Wildlife Habitat

Relationship (CWHR) size 4 (11 to 24 inch dbh) or greater trees and canopy closure greater than 60 percent. Buffers around natal and maternal den sites protect the habitat of importance to reproductive females. Protection of these reproductive sites is essential to prevent degradation of habitats used by reproductive females and to minimize disturbance of females during the reproductive period. Fuel treatment activities would be avoided in den site buffers, except as needed to protect human health and safety. In the absence of empirical data on female microhabitat use, an area equivalent to approximately 10 percent of the average home range or 700 acres should be adequate to protect these important areas. Furthermore, determining the location of den sites is difficult and time consuming and it is unknown how frequently den sites are reused. Project-level surveys are unlikely to locate new den sites. Radio-collared females monitored as part of demographic studies would yield the best information on the location of natal and maternal dens and microhabitat use. In lieu of demographic studies, larger, home range size areas could be established around detection locations. Detection locations likely represent a location used by the individual within the home range. Therefore, protecting a large area around the detection site is likely to protect habitat used by the detected fisher.

Protection of den sites is essential, yet is insufficient as a sole means for protecting fisher populations and providing suitable habitat for population expansions. Outside of the Southern Sierra Fisher Conservation Area habitat retention measures will only be considered within the estimated home range of the fisher after a fisher is detected. This approach does not directly address the habitat needs of dispersing fishers outside of the Southern Sierra Fisher Conservation Area. Retaining suitable fisher habitat within and outside of the Southern Sierra Fisher Conservation Area is necessary to maintain linkage between the southern Sierra Nevada population and the population in northwest California. The Forest Service assumes that the provision of California spotted owl habitat and Old Forest Emphasis areas will provide adequate connectivity for fishers across the action area. Lack of analysis on this subject leaves some uncertainty as to the efficacy of this portion of the strategy, especially in areas of extensive checkerboard ownership. The curtailment of habitat connectivity and genetic interchange between the southern Sierra Nevada fisher population and those in northwestern California. This may also result in the isolation of the southern Sierra Nevada fisher population, subjecting it to stochastic events and possible extirpation.

Activities under Forest Service control that result in habitat fragmentation or population isolation pose a risk to the persistence of fishers. Timber harvest, fuels reduction treatments, and road construction may result in the loss of habitat connectivity negatively impacting fisher distribution and abundance. The focus of vegetation treatments is in the mid-elevation mixed conifer and eastside pine forest types. Fuels hazard and associated risk reduction, either mechanical treatment, underburning or both could substantially change stand characteristics and potentially degrade fisher habitat. In addition, snags, coarse woody debris, and shrubby vegetation may be lost during fuels treatment. Managed natural fires, prescribed underburns, thinning and/or combinations of these can lead to the loss of both habitat or habitat components (i.e. reduce the pretreatment crown closure, change the mean stand dbh, and remove understory canopy) as these actions are intended to reduce the accumulation of fuels, both standing and dead and down woody material.

Potential effects of fire are unpredictable. There is a potential for prescribed burns to escape control and consume fisher dens and foraging habitat. The fuels reduction activities proposed within the project area are intended to reduce the likelihood of habitat loss through catastrophic, high severity, stand replacing fire. However, the immediate effects of fuel treatments to reduce the risk of such fires could also effectively reduce the quality of habitat available for fishers, particularly for resting and denning, to a level that is sufficient only for foraging or dispersal.

A decrease in high quality fisher habitat will force fishers to use marginal habitat areas, resulting in larger home ranges and less densely populated areas. This decrease will require higher energy expenditures by fishers. Fishers would have to forage and find mates over a larger area than they would if habitat components were maintained in high quality fisher habitat. It is not known how this might affect fisher reproductive success, though the loss, fragmentation, and/or degradation of these late-successional forest characteristics (coarse woody debris and large physical structures such as live trees, snags, and logs) is not likely to have a beneficial effect and may result in a reduction in the level of individual fisher fitness and reproductive success.

Key fisher habitat elements in structurally complex late-successional coniferous forests may be affected by Forest Service management activities or by similar activities on non-Forest Service lands. Reduction of any of these elements could pose a risk to fishers. Powell and Zielinski (1994) suggested that habitat suitable for resting and denning sites may be more limiting and that these habitats should be given more importance than foraging habitats when planning habitat management. Den sites will be protected from March 1 through June 30 with 700 acres consisting of the highest quality, largest, and most contiguous blocks of available fisher habitat. Fuel treatment activities would be avoided in den site buffers, except as needed to protect human health and safety.

New roads, trails, OHV routes, recreation and other developments will be evaluated for their potential effects to denning sites. However, impacts to fishers resulting from existing roads, trails, OHV routes, recreation and other developments will not be avoided or mitigated until disturbance to the denning site is documented. Roads can impact fishers in the following ways: (1) vehicles can kill animals and potentially increase mortality rates; (2) roads can fragment habitat and affect the ability of animals to use otherwise suitable habitat on opposing sides of the road; (3) roads, and the presence of vehicles and humans, can cause wildlife to modify their behavior; and (4) roads allow human access to wildlife habitat and can increase the direct impacts of human activities. Given the current low density of fishers in the Sierra Nevada, the loss of even a small number of individuals through road-related mortality could significantly impact the population. Predicted habitat for wide-ranging carnivores in the Rocky Mountains was associated with low road densities (Mace et al. 1999). There may be a threshold value for road density, above which the habitat cannot sustain certain wildlife species (Mech et al. 1988).

Studies have not yet specifically addressed the effects of roads on fisher populations and the Forest Service is not proposing to investigate these effects to foraging fishers, only to denning fishers. Incidental reports of road-killed fishers in California suggest that reduced road density and road speeds could benefit fishers. Given the current low density of fishers in the Sierra Nevada, the loss of even a small number of individuals through road-related mortality could significantly impact the population.

Recreational activities can affect wildlife species, but the effects are poorly understood (Knight and Gutzwiller 1995). Recreational activities can alter wildlife behavior, cause wildlife displacement from preferred habitat, and decrease reproductive success and individual vigor. Peak recreation levels often coincide with the most critical phases of the species' life cycle, such as during breeding and reproduction. Flight from human presence and interruption of behavior increase energetic costs experienced by an individual. Because of physiological constraints, these costs are greater for smaller animals. However, it is unclear how results from studies on other species might apply to forest carnivores.

The Service is also concerned that recovery options for the fisher will be precluded in east side forests because a landscape spotted owl strategy will not be applied in those areas. Maj and Garon (1994) provide maps of fisher observations from 1961 to 1982 and from 1983 to 1993 which show fisher locations in eastside habitats. Habitat degradation on the eastside would reduce potential fisher denning and resting sites, and may preclude further options for the development of a long-term management strategy to protect the fisher.

Effects of the Proposed Action

Mariposa pussy-paws, Springville clarkia, slender orcutt-grass, Layne's butterweed, Greene's tuctoria

Potential direct effects to the five plant species can arise from land disturbance activities associated with the Strategically Placed Area Treatments, the noxious weed control program, or the Lower Westside Hardwood Ecosystems management tools which include prescribed fire and mechanical treatments. The results of land disturbing activities such as logging, fuel wood harvesting, fire, and land clearing operations for a fuel break or log deck result in many similar effects to the five federally listed plants. Prescribed fire, logging operations, and fuel wood harvesting, including landing and road construction and rock quarrying, may directly adversely affect the five federally listed plant species. Plant mortality and related effects include mechanical disturbance and destruction from machinery or falling trees, dessication and death of plants as a result of humidity reduction due to canopy removal, and plant stress and death due to increases in temperature and insolation that result from canopy removal or replanting trees so closely as to reduce the amount of sunlight needed for survival. Herbaceous plant species will not survive being burned in a prescribed fire as part of a fuels reduction or weed control program, run over or dislodged by logging, land clearing equipment, or machinery or falling trees. Indirect adverse effects from logging and associated land disturbing activities include changes in surface and subsurface hydrology such as soil compaction result in lowering seedling survival and lowering infiltration of water needed for plant growth and survival, lowering soil aeration reducing the amounts of hydrogen needed by plant roots, increasing accelerated sheet, rill and gully erosion leading to exposure and death of plant roots due to soil losses, and increasing stream sedimentation that results in lowering water quality causing death of plants sensitive to water quality and quantity such as the vernal pool obligates *Orcuttia tenuis* and *Tuctoria greenei*. Losses of topsoil due to land management activities may also result in the direct losses of seeds in the seedbed which are necessary for the continued survival of annual or perennial plants and may adversely affect microtrophic plant species which depend on a thick duff layer and will die if duff and soil organic layers are washed away by changes in canopy cover or increases in overland sheet flows, as downslope from logging or land clearing operations.

Although many Forest Service land disturbance activities may adversely directly and indirectly affect listed plant populations, the implementation of the Standards and Guides for plant species will allow conservation of federally listed species. Without the plant Standards and Guides, elimination and minimization of direct and indirect impacts to the federally listed plant species will not be achieved nor progress toward recovery be accomplished.

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.

Ongoing or reasonably foreseeable future activities on private land will continue to affect habitat but the extent of that impact is unknown at this time. Over the past 20 years, timber harvest from Federal lands in California have declined from 1,725 MMBF in 1978 to 241 MMBF in 1999 (average of 1,191 MMBF) (Broad of Equalization 2000 report). At the same time, harvest on private lands has remained relatively stable with a high of 2,766 MMBF in 1978 to a near low of 1,903 in 1999 (average of 2,188 MMBF). This may change in the foreseeable future which would further fragment habitat on private land.

Nearly one million acres of timberland in the Sierra Nevada is owned by parties not primarily engaged in timber production. About 1.45 million acres in the Sierra Nevada are owned and managed as industrial forests, with about 12 major companies holding most of the land. Most industrial timberlands are located at mid-elevations in the mixed conifer forest type, the are including the potentially most productive fisher habitat in the Sierra Nevada. These lands are managed to produce a long-term sustained yield of forest products, primarily saw logs.

Population figures (Department of Finance 1999) for the Sierra Nevada show a marked increase over time. The Sierra Nevada Region counties presently contain an estimated 3.8 million people or about 10.8 percent of the combined total California and Nevada population of 35 million people. Approximately 70 percent of the Sierra Nevada population in California lives in the westside foothills. Between 1989 and 1999, populations in 13 counties in the Sierra Nevada Region grew faster than the California statewide average. Both Madera and Placer counties had a population increases of 40 percent for the period.

California and Nevada state agencies have projected population growth for the Sierra Nevada Region counties. In the next decade, most of the Sierra Nevada counties are expected to grow at a faster rate than they did between 1989 and 1999. Population increases have and will continue to affect how wildlife species utilize available habitat. Federal, state, counties and local agencies will need to respond to increasing needs in potable water, transportation systems, power, refuse treatment, wildland recreation, natural resource extraction, community fire protection, and all other community needs.

Cumulative effects on listed species including valley elderberry longhorn beetle, Owens tui chub, Paiute and Lahontan cutthroat trout, red-legged frog, bald eagle, southwestern willow flycatcher, Sierra Nevada bighorn sheep and any designated critical habitat within the ecosystems considered in this biological opinion include:

1) Continued human population growth in the Sierra Nevada foothills, in general, is expected to drive further development of agriculture, cities, industry, transportation, and water resources in the foreseeable future. Some of these future activities will not be subject to Federal jurisdiction (and thus are considered to enter into cumulative effects), and are likely to result in loss of habitats where these species occur. Development may also result in a decrease in water quality or quantity, and an increase in the likelihood that nonnative deleterious species and urban predators are introduced into listed species habitat;

2) Actions on private lands, primarily improper management of livestock grazing, diversions of water for irrigation and livestock watering, timber harvest and fuel treatments, and mining are likely to contribute to habitat degradation and loss in some areas, including introduction of toxic contaminants, reduction of plant species diversity and density, brood parasitism;

3) Construction of new reservoirs and their management (*e.g.,* fluctuating water levels or recreation activities) will result in the creation of additional habitat for nonnative species and also represents a loss of foraging, sheltering, and breeding habitat for listed species;

4) Dispersed recreation on non-Federal lands can also adversely impact listed species and their habitats. Camping near springs and streams impact riparian vegetation and streambank stability, while increased vehicle traffic on poorly designed or maintained roads, road crossings, and off-road vehicle use disturbs substrate and increases sedimentation. Recreational use of pack horses and saddle horse can cause localized impacts to riparian areas, springs and other areas depending on when, how, and the frequency of holding animals at a site. Off road vehicles and camping can cause denuding of vegetation on streambanks, sloughing of banks, compaction of soils, addition of nutrients and other pollutants to streams, sedimentation, reduction in woody species, and general alteration of habitat depending upon the frequency of use. Loss of vegetation can reduce the sediment trapping capability of riparian areas during spring runoff. Introductions of nonnative species are frequently attributed to use of live bait for fishing and unauthorized introductions of nonnative gamefish species are

sometimes associated with recreational fishing. Introduced species have adversely affected all listed aquatic species through competition, predation, and hybridization;

5) Population sampling with electro-fishing gear could harm or kill a small percentage of listed aquatic species. However, electro-fishing is an infrequent, but necessary component of population monitoring and adverse effects are expected to be temporary;

These effects are prolonged and pose significant threats to species already threatened or endangered throughout their range. Continued growth and development and other cumulative effects in the Sierra Nevada foothills is likely to exacerbate existing environmental conditions for species already in peril.

Conclusion

Valley Longhorn Elderberry Beetle

After reviewing the current status of the valley elderberry longhorn beetle, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that the Proposed action, is not likely to jeopardize the continued existence of the valley elderberry longhorn beetle. Actions will not occur within areas designated as critical habitat.

Owens Tui Chub

After reviewing the current status of the Owens tui chub, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that the Proposed action, is not likely to jeopardize the continued existence of the Owens tui chub. Actions will not occur within areas designated as critical habitat.

Paiute Cutthroat Trout and Lahontan Cutthroat Trout

After reviewing the proposed actions, the current status of the species, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the Proposed action, is not likely to jeopardize continued existence of the Lahontan cutthroat trout and the Paiute cutthroat trout. No critical habitat has been designated for these species, therefore, none will be affected.

California Red-legged Frog

After reviewing the current status of the red-legged frog, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that the Proposed action, is not likely to jeopardize the continued existence of the red-legged frog. The proposed action is not likely to result in destruction or adverse modification of critical habitat.

Bald Eagle

After reviewing the current status of the bald eagle, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that the Proposed action, is not likely to jeopardize the continued existence of the bald eagle. No critical habitat has been designated for this species, therefore, none will be affected.

Southwestern Willow Flycatcher

After reviewing the proposed actions, the current status of the species, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is the Service's biological opinion that the proposed action is not likely to jeopardize the continued existence of the southwestern willow flycatcher. The proposed action is not likely to result in destruction or adverse modification of critical habitat.

Sierra Nevada Bighorn Sheep

After reviewing the current status of the Sierra Nevada bighorn sheep, its environmental baseline, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that the Proposed action, is not likely to jeopardize the continued existence of the Sierra Nevada bighorn sheep. No critical habitat has been designated for this species, therefore, none will be affected.

Mariposa Pussypaws, Springville Clarkia, Slender Orcutt Grass, Layne's Butterweed, and Greene's Tuctoria

After reviewing the current status of the five federally listed plant species, the environmental baseline for the action area, the effects of the proposed action and its cumulative effects, it is the Service's biological opinion that the proposed action, is not likely to jeopardize the continued existence of *Calyptridium puchellum*, *Clarkia springvillensis*, *Orcuttia tenuis*, *Senecio layneae*, and *Tuctoria greenei*. No critical habitat has been designated for *Calyptridium puchellum*, *Clarkia springvillensis*, *Orcuttia tenuis*, *Senecio layneae*, and *Tuctoria greenei*; therefore, none will be affected.

Incidental Take Statement

The Forest Service's implementation of the standards and guidelines is likely to adversely affect listed and proposed species. However, the proposed action, by itself, is one of many steps in the land use planning process by the Forest Service. The likelihood of incidental take, and the identification of reasonable and prudent measures and terms and conditions to minimize such take, are addressed at many of these planning and implementation levels. These levels could include the adoption of standards and guidelines as they amend individual Land Resource Management Plans or the application of standards and guidelines at the project level. Any incidental take and measures to reduce such take cannot be effectively identified at the level of proposed action because of its generic nature and its regional scope: many of the standards and guides are narrative and thus represent broad, general principles that do not identify specific or quantitative criteria, and whose effect cannot be measured upon particular fores or land units at this level. Rather, incidental take and reasonable and prudent measures may be identified adequately through subsequent actions subject to section 7 consultations. Quantitative standards and guides that are proposed will also be applied to LRMP programs as they are amended by this decision and will be consulted in their application to existing programs. Further site specific projects utilizing these standards and guides are also subject to section 7 review to determine whether they are adequate to protect listed species at the project level.

<u>Reporting Requirements</u>

Upon locating dead, injured, or sick threatened, endangered or sensitive species when authorized activities are occurring, initial notification must be made to the Service's Division of Law Enforcement Senior Resident Agent within three working days. Please contact the Sacramento Fish and Wildlife Office at telephone number 916-414-6600 to report dead, injured or sick Little Kern golden trout, California red-legged frog, valley elderberry longhorn beetle, southwestern willow flycatcher, bald eagle, California spotted owl, Pacific fisher, California golden trout, mountain yellow legged frog, or Yosemite toad; contact the Nevada Fish and Wildlife Office at telephone number 775-861-6360 to report dead, injured or sick Lahontan or Paiute cutthroat trout; contact the Ventura Fish and Wildlife Office at 805-644-1766 to report dead, injured or sick Owen's tui chub, California bighorn sheep or California condor; contact the Klammath Falls Fish and Wildlife Office at 541-885-8481 to report dead, injured or sick Lost River sucker, Modoc sucker, or shortnose sucker; contact the Portland Fish and Wildlife Office at (503) 231-6179 to report dead, injured or sick Warner sucker. Instructions for proper handling and disposition of such specimens will be issued by the Division of Law Enforcement. Care must be taken in handling sick or injured threatened, endangered and sensitive species to ensure effective treatment and care, and in handling dead specimens to preserve biological material in the best possible state. In conjunction with the care of sick and injured fish or wildlife, the preservation of biological materials from a dead specimen, the FS has the responsibility to ensure that information relative to the date, time, and location of the wildlife, when found, and possible cause of injury or death of each must be recorded and provided to the Service.

Results of habitat and population monitoring conducted within the FS lands that may affect listed species will be provided to the Fish and Wildlife Office listed above for the respective species that fall within their jurisdiction. A complete report detailing monitoring results and impacts, especially unauthorized uses, will be submitted to the respective Fish and Wildlife Office at the beginning of the following calendar year.

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 implement recovery actions, to help implement recovery plans, to develop information, or otherwise further the purposes of the Act.

We have also included conservation recommendations for unlisted species that have been petitioned for listing pursuant to the Act (California spotted owl, Pacific fisher, mountain yellow-legged frog, Yosemite toad, and California golden trout). We have included recommendations for these species to assist your agency in the development and implementation of additional measures that we believe are necessary for the conservation of these species. Implementation of these recommendations in combination with the proposed standards and guidelines would provide benefits to these species that are not currently afforded protection under the Act and would improve viability on Forest Service lands.

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. We propose the following conservation recommendations:

Valley Elderberry Longhorn Beetle

1. Conduct field surveys for elderberry plants early enough in the project planning process that the project can be designed to avoid these host plants.

2. Prohibit grazing of livestock within 100 feet of elderberry plants that may provide habitat for the valley elderberry longhorn beetle.

3. Confine riparian clearing to the minimal area necessary to facilitate project activities.

4. All elderberry shrubs to be avoided within the vicinity of the proposed project would be flagged and surrounded with high-visibility fencing for the duration of construction activities.

5. Restore any damage occurring within 100 feet of elderberry shrubs that are not removed by the project.

6. Prevent the application of all pesticides within 100 feet of all retained elderberry shrubs with stems measuring 1 inch or greater in diameter at ground level.

7. Transplant all elderberry shrubs with stems measuring one inch in diameter or greater at ground level, following the Service's July 9, 1999, Conservation Guidelines for the Valley Elderberry Longhorn Beetle, from all impacted sites to the conservation area.

8. h elderberry stem measuring 1.0 inch or greater in diameter that is adversely affected (i.e. transplanted or destroyed) as a result of the proposed project should be replaced according to the Service's July 9, 1999, Conservation Guidelines for the Valley Elderberry Longhorn Beetle.

Owens Tui Chub

1. Assist the Service in implementing recovery actions identified within the Owens Basin Wetland and Aquatic Species Recovery Plan Inyo and Mono Counties, California, including:
   A. Delineating Conservation areas;
   B. Expand native fish habitat in Hot Creek Conservation Area;
   C. Protecting spring discharge in Hot Creek Conservation Area;
   D. Developing a nonnative predator (e.g.,fish and salamander) eradication program
   E. Determine if Owens tui chub in Little Hot Creek have hybridized with non-native chub. If the population is compromised, pursue eradication of existing population and reintroduce with genetically pure Owens tui chub stock.

2. A qualified biologist should monitor all road work adjacent to Owens tui chub habitat;
   A. Prior to road work in or adjacent to Owens tui chub habitat, all road maintenance crews should be educated regarding the protection and conservation needs for the Owens tui chub

3. A management plan should be prepared identifying procedures for minimizing take of Owens tui chub in the event of fire fighting in or adjacent to Owens tui chub habitat where water may be pumped from Owens tui chub habitat.

4. Prior to activities within Conservation Areas identified for the Owens tui chub in the Owens Basin Wetland and Aquatic Species Recovery Plan Inyo and Mono Counties, California, a Landscape Analysis should be completed and submitted for approval by the Service. The Landscape Analysis should include, but not be limited to:
   A. discussions of the management and maintenance in perpetuity of the habitats for Owens tui chub;
   B. .discussions of runoff control and maintenance of hydrology of the aquatic habitat;
   C. provisions for the design and implementation of a non-native species (e.g., fish, salamanders) eradication/control program for all aquatic areas;
   D. provisions for management and maintenance of spring flows (quality and Quantify) within the Conservation Areas;
   E. provisions for a written report to the Service, and CDFG on the functioning of the two Conservation Areas five years after the completion of the Landscape Analysis. The report should recommend maintenance practices, repairs, *etc*., (subject to review and approval by the Service and CDFG) necessary to ensure the continued functioning of Conservation Areas as Owens tui chub habitat.

Paiute Cutthroat Trout, Lahontan Cutthroat Trout, Little Kern Golden Trout

1. Assist the Service in implementing recovery actions identified within Recovery Plan for the LCT, including:

II. Working with the Service and other agencies in developing Recovery and Implementation Plans for the Truckee and Walker River Systems;

III. Work with the Service, the U.S.D.A. Wildlife Service and the California Department of Fish and Game to develop and implement a non-native, predator control program within occupied habitats for these species.

IV. Educate the public on the adverse impacts of non-native predators on listed species.

V. At least 90 percent of natural streambank stability should be maintained at the end of the authorized grazing season in areas that are occupied by LCT, PCT, GT-LK, CGT or LCT habitat within CARs. This means that no more than 10 percent of the natural streambank stability could be altered by activities such as, but not limited to: livestock trampling, chiseling and sloughing, OHV use, stream crossings, and recreational use.

VI. At least 80 percent of natural streambank stability should be maintained at the end of the authorized grazing season in areas that are unoccupied by LCT but are potential habitat, within historic range. This should apply to all streams in the action area within the Carson, Walker, and Truckee watersheds. This means that no more than 20 percent of the natural streambank stability in these watersheds could be altered by factors such as, but not limited to: livestock trampling, chiseling and sloughing, OHV use, stream crossings, and recreational use.

VII. Where unoccupied LCT streams are identified by the Service as egg incubation sites, reintroduction sites, or are identified as necessary to recover LCT, the FS should implement measures described in Measures 2 or 3 above, during the following grazing or use season for these identified unoccupied streams.

VIII. To aid recovery of threatened and endangered species and improve habitat conditions to allow expansion of existing populations, the FS should develop long-term allotment management plans (AMPs) for allotments necessary for the recovery of LCT, PCT, GT-LK, and CGT. Basic features of the AMPs should include: 1) Appropriate combinations of pasture rest, grazing intensity, rotation and timing of livestock use; 2) exclosure fencing or riparian pasture management to allow continual and timely improvements in the condition of uplands and riparian vegetation and achievement of desired future condition; 3) establish monitoring programs to document changes in riparian and upland vegetation and stream habitat condition; and 4) use of alternate watering systems.

IX. Dissolved oxygen, temperature, pH, specific conductance, nitrates, ammonia, total phosphorous, and total and/or fecal coliform bacteria should be regularly monitored in LCT streams to ensure adequate protection of water quality. At a minimum, sampling should occur: 1) Prior to the seasonal introduction of livestock to the allotment, and 2) near the point in time when livestock are removed from the allotment. If monitoring demonstrates that constituent concentrations exceed standards for designated beneficial uses, a water quality management plan should be developed and implemented. If standard exceedences are attributable to livestock, livestock should be removed from the stream and associated riparian area if compliance with water quality standards is not achieved within 2 years of implementation of the water quality management plan.

A. Designate all areas currently occupied by LCT as CARs.

B. Assist the Service in implementing recovery actions identified within Recovery Plan for the PCT. In addition, given the limited range of PCT, consider permanently closing all allotments within the historic range in the Silver King Drainage.

California Red-legged Frog

1. Assist the Service in implementing recovery actions identified within the Draft Recovery Plan for the red-legged frog, including:

    A. Working with the Service and other interested parties in developing a reestablishment program for red-legged frogs on National Forest Land;

    B. Developing a nonnative predator (e.g., bullfrogs and warmwater fish spp.) eradication program

2. Any individuals handling red-legged frogs should be prior-approved by the Service. All trapping protocol utilized should be prior-approved by the Service;

3. Prior to activities within Core Areas identified in the California Red-legged Frog Recovery Plan, a Landscape Analysis should be completed and submitted for approval by the Service. The Landscape Analysis should include, but not be limited to:

   A. discussions of the management and maintenance in perpetuity of the habitats for red-legged frogs;

   B. discussions of runoff control and maintenance of hydrology of the aquatic habitat;

   C. provisions for the design and implementation of a bullfrog eradication program for all aquatic areas;

   D. provisions for management and maintenance of upland habitat within the Core Areas;

   E. provisions for a written report to the Service, and CDFG on the functioning of the Core Areas five years after the completion of the Landscape Analysis. The report should recommend maintenance practices, repairs, *etc*., (subject to review and approval by the Service and CDFG) necessary to ensure the continued functioning of Core Areas as red-legged frog habitat.

4. At least 80 percent of natural streambank stability should be maintained at the end of the authorized grazing season in areas that are occupied by red-legged frogs or red-legged frog habitat within CARs. This means that no more than 20 percent of the natural streambank stability could be altered by activities such as, but not limited to: livestock trampling, chiseling and sloughing, OHV use, stream crossings, and recreational use.

5. Encourage or require the use of appropriate California native species in revegetation and habitat enhancement efforts associated with projects authorized by the Forest Service.

Mountain Yellow-legged Frog

1 A comprehensive fish eradication program should be implemented that removes nonnative fish from both occupied and unoccupied mountain yellow-legged frog watersheds to allow dispersal and the eventual recolonization of sufficient portions of the species historic range to ensure its survival and recovery.

2 Nonnative fish stocking within the historic range of the mountain yellow-legged frog should cease not only from lakes and watersheds with known frog populations, but also from unoccupied lakes within and between watersheds to allow for unimpeded dispersal of remaining frog populations.

3 Livestock grazing and packstock should not be permitted in RCAs with known and potential mountain yellow-legged frogs. In addition, mountain yellow-legged frog habitat areas identified by the conservation strategy team as important for recovery should also not be grazed by livestock or packstock.

4 In the absence of valid amphibian surveys and conservation agreements for special status amphibian species, the pesticide buffers described in Standard and Guideline RCA-12 should apply to all potential habitat of the California red-legged frog, foothill and mountain yellow-legged frogs, Cascade and northern leopard frogs and Yosemite toad. This recommendation should remain in effect until such time that adequate amphibian surveys have been conducted and conservation plans has been developed and implemented that identify key areas for

amphibian protection.

Yosemite Toad

1. Standard and Guideline RCA-41 should go further to eliminate livestock grazing from Yosemite toad habitat throughout the year to prevent the degradation of adjacent upland habitats, the introduction of sediment and pollutants into toad breeding sites, trampling of upland refugial habitat, dispersing cover for juvenile and adult toads, and alteration of meadow, stream and spring hydrology which constitutes toad breeding sites.

2. In the absence of valid amphibian surveys and conservation agreements for special status amphibian species, the pesticide buffers described in Standard and Guideline RCA-12 should apply to all potential habitat of the California red-legged frog, foothill and mountain yellow-legged frogs, Cascade and northern leopard frogs and Yosemite toad. This recommendation should remain in effect until such time that adequate amphibian surveys have been conducted and conservation plans has been developed and implemented that identify key areas for amphibian protection.

California Condor

1. All available information, including Avian Power Line Interaction Committee's published guidelines (1994, 1996), on the subject of avian mortalities due to collisions with man-made structures should be collected, knowledgeable persons interviewed, and further studies conducted to assess the magnitude of this situation.

2. Based on information collected above, all structures (towers, transmission lines, etc.), including any special use permits, proposed on Forest Service land should be located and designed to avoid possible condor mortalities.

3. Continue the enforcement of adopted Forest service guidelines that protect known condor nest sites and known and potential roost sites (such as stands with dominant and co-dominant trees) from activities that could adversely modify or destroy them, and provide adequate protection against human disturbance at such sites. Minimize the impact of the proposed action on California condor habitat.

Bald Eagle

I. Assist the Service in further implementing recovery actions identified within the Recovery Plan for the bald eagle.

II. Conduct systematic surveys across the landscape to detect additional bald eagle nests and communal night roosts.

III. Monitor bald eagle responses to human generated disturbances, including threats and changes to bald eagle habitat. If the data results indicate bald eagles are exposed and negatively impacted by disturbances, consult with the Service on ways to minimize the impacts.

IV. Promote public education regarding the importance and successes of conservation and protection of the bald eagle and other listed species. This can be done using signs in occupied habitat, brochures at ranger stations, and other mediums.

V. Within two years of the signing of the Record of Decision, prepare a bald eagle management plan for every basin or site in the analysis area with occupied bald eagle territories. Each bald eagle management plan should be prepared in consultation with the Service. The objective of a bald eagle management plan should be to perpetuate existing habitat conditions in the nesting, foraging, and wintering areas to maintain nesting pairs of bald eagles and to provide for additional nesting territories, based on the habitat suitability and carrying capacity of the area (as measured using Peterson's (1986) bald eagle habitat suitability index model). Each bald eagle management plan should address the effects of recreation, mining, timber management, residential development, hydroelectric power production, fisheries management, and other effects to bald eagles while offering measures to minimize these effects, including:

A. Seasonal (January 1 to August 31 or 3 weeks after chicks have fledged) road closures within a quarter mile of bald eagle use areas should be implemented on roads, off-highway vehicle routes, or over snow vehicle routes within a quarter mile of bald eagle nesting, roosting, or wintering areas.

B. Seasonal (January 1 to August 31 or 3 weeks after chicks have fledged) boating restrictions should be implemented within a quarter mile of bald eagle use areas where recreational boating and other water activities pose potential negative impacts to breeding, roosting, or wintering bald eagles.

C. Seasonal (January 1 to August 31 or 3 weeks after chicks have fledged) trail restrictions should be implemented within 500 feet of a bald eagle nesting, roosting, or wintering area where hiking and bicycling trails pose potential negative impacts to the bald eagle use area.

D. Non-system and other roads that lead to sensitive bald eagle habitat such as nesting, foraging, or roosting sites should be gated and bermed.

E. Protection and enhancement of fish habitat in occupied bald eagle use areas through the maintenance of streambank stability by restricting activities such as, but not limited to livestock trampling, OHV use, stream crossings, and recreational use.

F. Protection and enhancement of waterfowl habitat in occupied bald eagle use areas through the maintenance of riparian and lake shore vegetation (waterfowl nesting habitat) by restricting activities such as, but not limited to livestock trampling and grazing, OHV use, and recreational use.

G. Seasonal restrictions on logging activities to avoid the bald eagle breeding period (January 1 to August 31 or 3 weeks after chicks have fledged) within one half mile of a nest. This should be increased to one mile for helicopter logging activities. In areas with wintering bald eagles, implement seasonal restrictions on logging activities to avoid the bald eagle wintering period (approximately November 15 to March 15) within one quarter mile of roosts, increase to one half mile for helicopter logging activities.

H. Seasonal restrictions on prescribed burns. Do not implement prescribed burns within one quarter mile of a nest during the breeding season (January 1 to August 31 or 3 weeks after chicks have fledged). If the nest is unoccupied or prescribed burns are to take place outside of the breeding season, maintain the fire at a distance of 500 feet from the nest. Fuels within a 500 foot radius of the nest should be hand thinned. In areas within 500 feet of bald eagle roosts and perches, implement seasonal restrictions on prescribed burns to avoid the bald eagle wintering period (approximately November 15 to March 15).

California Spotted Owl

1. Develop and improve methods of typing, mapping, and quantifying spotted owl habitat using remote sensing techniques. Develop statistically reliable means for calibrating habitat estimates derived from different techniques.

2. Develop and support long-term research studies designed to correlate habitat and environmental variables with spotted owl demographic parameters, and to evaluate effects of fuels treatments on spotted owl populations.

3. Develop and support long-term research studies designed to correlate habitat and environmental variables with population parameters of important spotted owl prey species, especially the northern flying squirrel, and to evaluate effects of fuels treatments on spotted owl prey species.

4. Because mechanical fuels treatments proposed under this action are disproportionally focused on the QLG area, additional widespread vegetation treatment experiments using more intensive prescriptions than prescribed in the selected alternative should be conducted outside the QLG area to disperse the risk to owl populations.

5. Evaluate and minimize the potential effects of the action in Areas of Concern. Assess effects in terms of providing sufficient habitat in core areas and overall home ranges to support high rates of adult survival and reproduction. Where existing habitat in Areas of Concern appears insufficient in quantity or quality, limit the extent of treatments, and strategically apply treatments to protect and benefit existing habitat stands.

6. To protect patches of old forest that may be key components of current and future spotted owl habitat, during project level evaluation, identify on maps all stands at least one acre in size of CWHR class 5M, 5D, and 6 and manage these stands according to the standards and guidelines provided in the FEIS for these CWHR classes.

7. To prevent further degradation of California spotted owl habitat, immediately apply the owl conservation strategy of this decision, including survey requirements for owls and vegetative prescriptions, to existing vegetation management projects, including timber sales under contract. This is particularly important in PACs, spotted owl home range core areas, old forest emphasis areas, and areas of concern.

Southwestern willow flycatcher

1. The Forest Service should take steps to minimize brown-headed cowbird brood parasitism in southwestern willow flycatcher habitat, including:

    A. Currently, the Army Corps of Engineers funds an annual cowbird trapping and willow flycatcher nest monitoring program that includes the South Fork Wildlife Area. This program is effectively minimizing the adverse affect of brown-headed cowbird brood parasitism. If the Army Corps of Engineers curtails funding for this program, the Forest Service should ensure that funding is made available to continue annual cowbird trapping and willow flycatcher nest monitoring in the South Fork Wildlife Area.

B. The Forest Service should not renew grazing allotments, which are grazed during the breeding season,in and adjacent to (within 4.5 miles; the known distance brown-headed cowbirds may travel for the purposes of brood parasitism) suitable southwestern willow flycatcher habitat.

C. Eliminate as much edge habitat as possible (parasitism rates are highest near forest-field edges). Maintain and promote suitable habitat with a high ratio of non-edge, "interior" habitat to edge habitat. Efforts should be made to avoid fragmenting large tracts of suitable southwestern willow flycatcher habitat, forests, and grasslands into smaller pieces with more field-forest edge.

2. No livestock grazing should occur within the Lake Isabella Allotment and other suitable southwestern willow flycatcher habitat from May through August.

3. Prescribed burn programs in suitable southwestern willow flycatcher habitat should not occur during the spring time.

4. Contribute funds or staff time to an annual California Statewide survey effort for southwestern willow flycatcher.

5. Acquire additional suitable or potential southwestern willow flycatcher habitat throughout the range of the species and implement management plans to maintain or recover habitat and reduce disturbance.

6. Develop and implement an educational program for communities within the Isabella Reservoir vicinity. The program should focus on riparian and wetland ecosystems and their value to neotropical migratory birds, including the southwestern willow flycatcher.

7. Work with the Service in the development of a recovery strategy for the southwestern willow flycatcher.

8. Assist the managers of the Kern River Preserve and South Fork Wildlife Area with non-native vegetation removal.

9. If invasive species pose a problem to the health of the riparian corridor such that habitat suitability for southwestern willow flycatcher is threatened, carry out the removal of non-native vegetation on all lands, in the historic range of the species, that provide suitable habitat for southwestern willow flycatcher.

10. The Forest Service should conduct neotropical migrant bird surveys in southwestern willow flycatcher habitat. Upon detection of southwestern willow flycatchers, the Forest Service should monitor the status of the bird(s) throughout the breeding season.

11. Implement a habitat enhancement plan including riparian vegetation restoration on all Forest Service lands, in the historic range of the southwestern willow flycatcher, that could provide suitable habitat for the species.

12. The Forest Service should provide reports to the Service on all studies and monitoring conducted under this biological opinion. Reports for each breeding season will be submitted annually to the Service by November 1 of each year and will be used to determine the efficacy of incidental take minimization measures.

Sierra Nevada Bighorn Sheep

1. Assist the Service in implementing recovery actions identified within the Draft Recovery Plan (once approved) for the Sierra Nevada bighorn sheep;

2. The Service contends that the elimination of domestic sheep grazing in proximity to Sierra Nevada bighorn sheep is the only permanent method that can ensure the elimination of risk of disease transmission over the long term. However, current information suggests some specific domestic sheep operations which are intensely managed to prevent stray domestic sheep and contact with bighorn sheep may continue in proximity to bighorn sheep. Ongoing monitoring and annual review is critical to allow such operations to continue. If domestic sheep operations cannot be managed in a way that prevents stray domestic sheep, then domestic sheep grazing in proximity to Sierra Nevada bighorn sheep should be eliminated.

3. Biologists with experience in observing and monitoring Sierra Nevada bighorn sheep should monitor areas prior to and during any prescribed burn or mechanical treatment. These biologists should provide guidance to the Forest Service regarding the proposed treatment.

4. The Forest Service should work to complete a “Final Interagency Domestic Sheep Management Strategy” and adopt and implement the strategy.

   A. Design prescribed fires to achieve increased forage quality for bighorn sheep by season of burn and intensity.

   B. Treat brush stands currently providing hiding cover for mountain lions to reduce the risk of predation on bighorn sheep.

Pacific Fisher

Coordinate with Pacific fisher scientific experts to create a forest carnivore network connecting forest land that stretches from known Pacific fisher populations in northwestern California to the Southern Sierra Fisher Conservation Area. Manage forest lands within this carnivore network to protect existing suitable fisher denning, resting and dispersal habitat, and allow nonsuitable habitat to achieve suitability. Protect all snags and course woody-debris that provide suitable den and rest sites within the network Limit timber harvest and fuel treatment prescriptions that create large openings or simplify multistoried forest canopies (retain a minimum of 60 percent canopy cover) within the carnivore network. In addition, prohibit road, trail and other infrastructure construction, snowmobile use and other forms of disturbance within the designated carnivore network.

Conduct project-level fisher surveys to guide management of the fisher at the local level and better analyze effects of projects to the species.

When individual fishers are detected outside of the Southern Sierra Fisher Conservation Area, create protected activity centers around these sites to protect sufficient denning, resting and dispersal habitat to support fisher home ranges. Incorporate protected activity centers into the forest carnivore network described above.

In areas with fisher denning or resting sites, foraging areas, or other occupied habitat, minimize impacts resulting from existing roads, trails, OHV routes, recreation, and other developments by decommissioning existing facilities, relocating nonessential infrastructure outside of fisher use areas and implementing seasonal closures to avoid impacts to fishers.

To ensure the effectiveness of connectivity between the Southern Sierra Fisher Conservation Area and the fisher populations in northwest California, submit annual reports and analyses of suitable fisher habitat across the landscape throughout the action area.

Mariposa pussypaws, Springville clarkia, slender orcutt grass, Layne's Butterweed, Greene's tuctoria

1. Conduct field surveys for federally listed plant species early enough in the project planning process that the project can be designed to conserve or enhance the listed plants and their habitats. Conduct plant surveys according to procedures outlines in the Forest Services Handbook (FSH 2609.25.11). If additional field surveys are to be conducted as part of project implementation, survey results should be documented in the project files.

2.. Minimize or eliminate direct and indirect impacts from management activities to federally listed plant species unless the project is designed to maintain or improve plant populations.

REINITIATION NOTICE

This concludes formal consultation and conference on the proposed action as outlined in your FEIS, RBA, draft ROD, and your December 26, 2000, request for initiation of formal consultation. 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 proposed 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 listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat is designated that may be affected by the proposed action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

If you have any questions or concerns about this consultation or the consultation process in general, please contact me at (916) 414-6700.

Sincerely,

Wayne S. White
Field Supervisor

cc: FWS: Reno
FWS: Klamath Falls
FWS: Ventura
FWS: Carlsbad
FWS: Portland

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