to improve the resiliency of the forest, reduce the potential for stand replacing fire and reduce the amount of smoke emissions (Brown and others, 2004).

The air quality in the San Joaquin Valley (Valley) is among the poorest in the state. On average the Valley experiences 35-40 days when it exceeds the federal health-based standards for ground-level ozone and more than 100 days over the state ozone standard. While levels of airborne particulates exceed the federal standard less than fives time annually, because the California standard is set at a lower and more protective level, the Valley exceeds this limit an average of 90-100 days per year (SJVUAPCD, 2003).

Currently the Valley is federally classified as severe non-attainment for the federal ground-level ozone and particulate matter less than 10 microns in diameter (PM_{10}) standard. Additionally, the valley is classified as severe non-attainment for the California ozone standard and non-attainment for the state's PM_{10} standard (attainment status for PM_{10} was requested from the Environmental Protection Agency (EPA) on April 25, 2006. www.valleyair.org, 2006).

Smoke is a limiting factor in how many acres of natural and activity fuels can be treated per project per year (the KRP Air Conformity Determination Document is incorporated by reference). By increasing forest utilization where possible and limiting the use of prescribed fire to reduce hazardous fuel conditions to those areas where other management treatments are not feasible, we can restore the forest to pre-1850 conditions, reintroduce fire as an ecosystem process (Blackwell, 2004) and limit the amount of wildfire and prescribed fire created emissions into the San Joaquin Valley.

Environmental Consequences

Alternative 1 – Proposed Action

Direct Effects: Post thinning burn treatments under this alternative would produce 3667 tons of particulate matter (PM_{10}), 1666 tons of nitrous oxide (NO_x) under dry burning conditions, compared to 48,000 tons (PM_{10}) that would be produced in the event of a wildfire of the same acreage; a reduction of 85 percent. The California State Implementation Plan (SIP) restricts emissions to a maximum of 70 tons per project per year for PM_{10} and 25 tons for NO_x for severe non-attainment areas (San Joaquin Valley Unified Air Pollution Control District 2003).

PM_{10} rather than NO_x would be the limiting factor for underburning and NOx would be the limiting factor for pile burning in the Kings River Project. This would restrict the number of treated areas for Kings River Project to 570 acres of underburning and 245 acres of piled slash per management unit per year. This would take from 2.7 to 4 years for completion if burning (depending on management unit, number of acres and type of prescribed fire treatment) were limited to autumn conditions. The number of acres allowed each year would be governed by the proposed amounts of activity created slash (0-10 inches in diameter) after thinning, which would be removed by prescribed fire, tractor and hand piling and the season in which the burns are conducted. Mechanical treatments of vegetation through the use of logging equipment also produce PM_{10}, exhaust hydrocarbons and fugitive dust. Total PM_{10} emissions produced from the use of mechanical equipment is 5.7 tons. Exhaust hydrocarbons emissions total 4.84 tons,

nitrous oxides total 72.3 tons for the entire project, but fugitive dust is exempt from this project. Refer to the Air Quality Determination for this project for further details.

Indirect Effects: The potential for indirect and cumulative effects are from exposure to organic hydrocarbons (precursors to smog under high daytime temperatures), large particulate matter, and PM_{10} produced from prescribed fires. These emissions are easily inhaled and can cause respiratory and pulmonary distress.

The Fresno Metropolitan area, the community of Shaver Lake, the recreation residences, the Dinkey Creek Recreation Area and the private subdivisions within Providence Creek and Exchecquer are considered smoke sensitive areas. These areas could be affected by smoke if weather patterns produce a stable air mass and smoke is unable to vent into the upper atmosphere. Since PM_{10} and NOx are public health hazards, prescribed burns would be planned during periods of unstable air, which would allow for proper ventilation. However, since prescribed underburns could last for several days or weeks there is potential for recurring shifts in air masses towards more stable conditions. The production of PM_{10} is always a consideration and under conditions of poor ventilation could present problems throughout the year. All burning activities would be implemented under optimum conditions using Best Available Control Measures to prevent smoke concentrations from affecting local communities.

Cumulative Effects: Cumulative effects can be expected within the Kings River Project Area from current and foreseeable future projects. Within the Kings River Project are several prescribed underburns that would continue as part of the High Sierra Ranger District Program of Work. The KRP includes within its boundaries the Front Country and Turtle Underburn Programs. The combined acres of these underburn programs is 12,000 acres. All underburns are in ponderosa pine or mixed conifer forested areas, have been treated at least once, and are in maintenance status. Typically 2000 acres per year are burned as part of this program and would continue unaffected by the alternative chosen. An estimate of emissions for the underburn program is based on 2000 acres treated per year with an average of 3 tons per acre consumed (APCD Work Plan, 2005).

Table 3-18 - Tons of estimated pollutants, underburn program of work[8]

PM_{10}	**$PM_{2.5}$**	**NO_x**	**SO_2**	**VOCs**	**CO**
73.5	66	10.5	.30	43.5	699.0

A cumulative effect could also be in the occurrence of respiratory or pulmonary distress when a wildland fire occurs in the area. The 4132 acre North Fork Fire in 2000 on the Bass Lake Ranger District produced nearly 2388 tons of PM_{10} emissions and a wildfire occurring in the Kings River Project area of the same size would produce nearly 48,000 tons of PM_{10} emissions (KRP EIS Air Conformity Determination). The San Joaquin Valley is classified in a severe non-attainment status for PM_{10} emissions and ozone and had expected to be elevated to an extreme non-attainment status by the Environmental

[8] **PM_{10}**: Particulate Matter greater than (>) 10 microns in size. **$PM_{2.5}$**: Particulate Matter > 2.5 microns in size, **NO_x**: Nitrous oxide, **SO_2**: Sulpher Dioxide, **VOCs**: Visual Organic Compounds (precursors to smog), **CO**: Carbon Monoxide.

Protection Agency and the San Joaquin Valley Unified Air Pollution Control District. Emissions from wildfires subside into the San Joaquin Valley during stable summer air patterns; smoke emissions from wildfires can cause air pollution alerts not only in local mountain communities but also in the central valley.

Other past, present and foreseeable future projects within the Kings River Project Area include the afore-mentioned Prescribed Burn Program of Work (including the South of Shaver Project), cattle grazing, the district plantation and vegetation management program, Off Highway Vehicle (OHV) use, the Helms-Gregg 230 kV Transmission Line Right-of-Way, and private land management activities and timber sales. Cumulative effects to air quality include any vegetation management program (public or private) in which vegetation will be burned, or where vehicle and heavy equipment use contributes to exhaust emissions or fugitive dust. The projects that could and possible will contribute to air quality cumulative effects from particulate matter PM_{10} include the Southern California Edison (SCE) Company's forestry and prescribed burn program, the High Sierra District plantation and vegetation management program, and the vegetation treatments in the Wildflower Subdivision type conversion. No burning will take place as part of the Helms-Gregg transmission line project. Cumulative effects to air quality from exhaust emissions and fugitive dust from can be expected from the SCE forestry program, the Helms-Gregg transmission line project, OHV use, and the vegetation management treatments on private and public lands including the district plantation management program. It is unknown how much heavy equipment use and or prescribed burning may take place as part of the SCE program or vegetation management activities on private land.

The past timber sales of Patterson, Deer, Snow Corral and Hall no longer have air quality direct or indirect effects and therefore no longer have any cumulative effects, as these timber sales no longer have any proposed activities. The Reese and the Indian Rock Timber Sales still have on-going underburn work and are part of the districts Prescribed Burn Program of Work; the cumulative effects to air quality are included with the discussion above.

Alternative 2 – No Action

Direct and Indirect Effects: There are no direct or indirect effects under Alternative 2. No treatments associated with the proposed action would take place.

Cumulative Effects: Within the Kings River Project are several prescribed underburns that would continue as part of the High Sierra Ranger District Program of Work. The KRP includes within its boundaries the Front Country and Turtle Underburn Programs. The combined acres of these underburn programs is 12,000 acres. All underburns are in ponderosa pine or mixed conifer forested areas, have been treated at least once, and are in maintenance status. Typically 2000 acres per year are burned as part of this program and would continue unaffected by the alternative chosen. An estimate of emissions for the underburn program is based on 2000 acres treated per year with an average of 3 tons per acre consumed (APCD Work Plan, 2005).

Table 3-19 - Tons of estimated pollutants, underburn program of work

PM_{10}	$PM_{2.5}$	NO_x	SO_2	VOCs	CO
73.5	66	10.5	.30	43.5	699.0

Indirect or cumulative effects would also be the occurrence of respiratory or pulmonary distress when a wildland fire occurs in the area. The North Fork Fire in 2000 on the Bass Lake Ranger District produced nearly 2388 tons of PM_{10} emissions and a wildfire occurring in the Kings River Project area would produce nearly 48,000 tons of PM_{10} emissions. The San Joaquin Valley is classified in a severe non-attainment status for PM_{10} emissions and ozone and is expected to be elevated to an extreme non-attainment status by the Environmental Protection Agency and the San Joaquin Valley Unified Air Pollution Control District. Emissions from wildfires subside into the San Joaquin Valley during stable summer air patterns; smoke emissions from wildfires can cause air pollution alerts not only in local mountain communities but also in the central valley.

Other past, present and foreseeable future projects within the Kings River Project Area include the afore-mentioned Prescribed Burn Program of Work (including the South of Shaver Project), cattle grazing, the district plantation and vegetation management program, Off Highway Vehicle (OHV) use, the Helms-Gregg 230 kV Transmission Line Right-of-Way, and private land management activities. Cumulative effects to air quality include any vegetation management program (public or private) in which vegetation will be burned, or where vehicle and heavy equipment use contributes to exhaust emissions or fugitive dust. The projects that could and possibly will contribute to air quality cumulative effects from particulate matter PM_{10} include the SCE forestry and prescribed burn program, the High Sierra District plantation and vegetation management program, and the vegetation treatments in the Wildflower Subdivision type conversion. No burning will take place as part of the Helms-Gregg transmission line project. Cumulative effects to air quality from exhaust emissions and fugitive dust from can be expected from the SCE forestry program, the Helms-Gregg transmission line project, OHV use, and the vegetation management treatments on private and public lands including the district plantation management program. It is unknown how much heavy equipment use and or prescribed burning may take place as part of the SCE program or vegetation management activities on private land. Cumulative effects to air quality from all other projects outside of this decision are the same for Alternative 1 – the Proposed Action, Alternative 2 – the No Action and Alternative 3- The Reduction in Tree Harvest Size.

Alternative 3 – Reduction in Tree Harvest Size

Direct, Indirect and Cumulative Effects: The direct, indirect and cumulative effects of Alternative 3 are the same as those of the Proposed Action. Alternative 3 makes only negligible reductions in the amount of slash that will be treated.

BOTANICAL RESOURCES

Affected Environment

Botanical surveys were conducted during 2004, focusing on areas of suitable habitat for Threatened, Endangered and Sensitive (TES) plants, and on disturbed areas likely to be invaded by noxious weeds. Several occurrences of sensitive plants and invasive or noxious weeds are known to occur within the project area. See Biological Evaluation for further details of sensitive plant field surveys and effects analysis. It is on file at the High Sierra Ranger District office and is incorporated by reference. The following is a summary of survey results for each of the eight initial units:

- Bear_fen_6 Management Unit – No sensitive plants are known to occur in this unit. Spanish broom occurs on 10S67 where the road crosses Oak Flat Creek extending about 100' of roadside. Bull thistle occurs at the junction of 11S91 and 11S91B; along 11S55; along road 10A45 in about three places; and along 11S91. Noxious weeds or invasive plants: A few patches of cheatgrass occur on exposed road slopes along 10A45. Klamathweed (*Hypericum perforatum*) is present along 11S61 where it borders the southwestern side of the management unit.

- El_o_win_1 Management Unit - No sensitive plants are known to occur in this management unit. Noxious weeds or invasive plants: Bull thistle was found in the vicinity of Dinkey Meadow Creek near the gate of Camp El-O-Win, and in a moist area north of the tributary in T10S, R26E, NW ¼ section 20. An occurrence of common mullein (*Verbascum thapsus*) has been recorded in the el_o_win_1 unit near the Dinkey Creek day ride station.

- Glen_mdw_1 Management Unit - No sensitive plants are known to occur within this management unit. Noxious weeds or invasive plants: Bull thistle was found in several patches in this management unit: on the eastern half of the old sawmill site (T10S, R26E, NW ¼ section 17); along some of the day ride trails used by Clyde Pack Operation (CPO) (T10S, R26E, section 17); about 1.1 miles north on 9S09, west of "Trail's End" picnic area; in a meadow in T10S, R26E, NE ¼ section 13; and in the large gully approximately located on the boundary between private and Forest Service land in T10S, R26E, NE ¼ section 13. An occurrence of lens-podded hoary cress (*Cardaria chalepensis*) was found in front of the CPO horse corrals at the Dinkey day ride station. Cheatgrass is scattered throughout the old sawmill site, as well as on the banks of the large gully approximately located on the boundary between private and Forest Service land in T10S, R26E, NE ¼ section 13.

- Krew_bul_1 Management Unit - *Meesia triquetra*, sensitive plant is found in a meadow in southern branch of the Bull Creek drainage. The meadow falls partly within, and partially outside of the unit. The area of the *Meesia triquetra* occurrence appears to be a fen. Noxious weeds or invasive plants: No noxious weeds are known to occur within this management unit.

- Krew_prv_1 Management Unit - *Meesia triquetra*, a sensitive plant was found in Glen Meadow and in the meadow east of 10S25, about 1/5 mile north of the Southern California Edison property boundary. Both of the *Meesia triquetra* occurrences are in fen-like areas. Noxious weeds or invasive plants: Bull thistle was found on the northern end of Glen meadow, and scattered throughout the vicinity of Road 10S11.

- N_soapro_2 Management Unit - Golden annual lupine, a sensitive plant, occurs scattered throughout the gravelly soils of this unit. About 25% of the rock outcrops in the unit were surveyed, and most of them were found to support golden annual lupine. A patch of carpenteria is in the western, central part of the management unit. Noxious weeds or invasive plants: A patch of tocalote (*Centaurea melitensis*) about 60' by 60' in size is present on the roadside and downhill into a draw, west of 10S04. A small patch of foxglove (*Digitalis purpurea*) plants were found

along 10S24, near the southern end of the unit. Cheatgrass is present near the plantation in the middle of the unit.

- Providen_1 Management Unit - Golden annual lupine a sensitive plant *(Lupinus citrinus* var. *citrinus*) is found on two rock outcrops within the unit. Habitat for the California red-legged frog, foothill yellow-legged frog, relictual slender salamander, resident trout species, and the western pond turtle occur within the management unit. Noxious weeds or invasive plants: Bull thistle (*Cirsium vulgare*) was found along Road 10S75 near the creek in T10S, R25E, SW ¼ Section 15, near the southern end of road 10S87. It is also known to occur along 10S39 in section 9; in two patches along 10S18 in section 16; and on the road that runs along the top of Grand Bluff in section 10. Spanish broom (*Spartium junceum*) is found just to the south of the management unit along 10S18.

- Providen_4 Management Unit - Golden annual lupine a sensitive plant was found on the edges of plantation units on 10S14 near the southern end of the unit. The southern edge of the unit may be *Carpenteria californica* habitat. Noxious weeds or invasive plants: Cheatgrass (*Bromus tectorum*) was scattered in patches through the plantations in this unit, mainly on old skid roads that have not been colonized with bear clover, manzanita, or *Ceanothus* spp. A patch of broom (Scotch and or Spanish) is recorded along 10S02, slightly north of its intersection with 10S55. Bull thistle was found near the broom.

Species known to occur within the project area:

Carpenteria californica (carpenteria) 1500'-4400'
Carpenteria is an evergreen shrub that mostly occurs in chaparral habitat, but some plants are found in the lower yellow pine belt. The entire distribution of this species is found within a total area of 225 square miles, south of the San Joaquin River and north of the Kings River (with one occurrence just north of the San Joaquin River). Shrubs tend to concentrate and grow most vigorously in draws and ravines in well-drained granitic soils where moisture is relatively abundant. The n_soapro_2 unit has one recorded occurrence of this species.

Lupinus citrinus var. *citrinus* (golden annual lupine) 1500'-5500'
This annual lupine occurs in the foothills and lower conifer forest of Fresno and Madera Counties. Most of the known populations occur on the Sierra National Forest south of the San Joaquin River. With approximately 82 occurrences and dozens of occurrences over 100 individuals, the metapopulation is considered robust (Clines and Symonds 2006). Typical habitat are edges and gravelly shelves of granite outcrops, openings in ponderosa pine forest, oak woodland, or chaparral. Several occurrences of this species are known to occur in the n_soapro_2 and providen_1 units.

Meesia triquetra (moss) 6000'-8000'
In California, *Meesia triquetra* is currently known from 6 Sierra Nevada national forests and Sequoia National Park. *Meesia triquetra* is known from about 19 meadows in the Sierra National Forest. This species is more common in other parts of its range. Few meadows in the southern Sierra have *Meesia triquetra*. Primary threats are activities that alter meadow hydrology. Some historical occurrences have been extirpated by changes in land uses. This species seems to prefer meadows with high acidity, indicated by the presence of associates such as blueberry (*Vaccinium*), peat moss (*Sphagnum*) and sundew (*Drosera*). Cold spring fed areas in the meadow seem to be preferred. This moss

requires permanent saturation and will not occur in meadows that dry out. This species is known to occur in three meadows within the krew_prv_1 and krew_bul_1 units.

Peltigera venosa (veined water lichen) 4000'-8000
This aquatic lichen (formerly known as *Hydrothyria venosa*) is known from only a few occurrences in California. It is found in cold, unpolluted streams on the west slope of the Sierra Nevada in mixed conifer forests on the Sequoia, Sierra, and Stanislaus National Forests. This aquatic lichen occurs submerged on rocks in clear, running, mountain streams. The species fixes nitrogen, is intolerant of pollution and sedimentation, and grows in clear, cool, moving water. The California occurrences are disjunct from the other U.S. populations (Hale & Cole, 1988). According to botanist Jim Shevock, this lichen has been in decline throughout its historical range although he states that the Sierra Nevada populations appear stable at this time (Sierra National Forest Sensitive Plant Files, Supervisor's Office, Clovis CA, 1998). The Pacific Southwest Research Station (PSW) botanist, Chris Dolanc surveyed the branch of Providence Creek that frames the west and north sides of T10S, R25E, section 13 in three places for this species, and he surveyed three creeks in the krew_bul_1 unit in several places for this species (the creek in the SE ¼ of T11S, R26E, section 12 and SW ¼ of T11S, R27E, section 7; the branch of Bull Creek that is in the southern section of T11S, R27E, section 7; and the branch of Bull Creek that follows the southwest boundary of the unit in T11S, R27E, section 18). No veined water lichen was found in any of these locations.

A recent survey (6/22/2006) has found veined water lichen in Summit Creek at T9S, R25 E, sections 2 and 3, within the KRP boundary and approximately .5 miles north of providen _1; it is assumed that it exists within providen_1 unit. Veined water lichen is known to occur in Teakettle Creek which is just east of the krew_bul_1 unit, and in n_422_1 and 2, about 0.5 mile north of krew_bul_1.

Species for which suitable habitat may occur within the Initial Eight Management Units:

Botrychium crenulatum (scalloped moonwort) 4875'-8125'
Scalloped moonwort has a wide range including both the northern and southern hemispheres, but is rare throughout its range. This fern occurs in meadows and marshes in the central Sierra, although there are no known occurrences in the Sierra National Forest at this time.

Botrychium lineare (slender moonwort) 8000'-9000'
Slender moonwort grows in rocky, moist sites in subalpine conifer forest. This species is found sporadically and infrequently throughout the northwestern United States, and is suspected to exist in California (Farrar, 2001). There is an historical location in Piute Canyon, thought to be approximately seven miles from the Hooper OHV route. The location data for this location is ambiguous, however, and may or may not be on the Sierra National Forest. Its habitat is similar to *B. crenulatum*. The very eastern edge of the krew_bul_1 unit falls between 8000' and 8080' – within the elevational range of slender moonwort. From orthoquads, however, it does not appear that any meadows fall within this strip, and the species is not expected to be within the management unit,

although it cannot be definitely ruled out, as not all appropriate habitat can be detected from an orthoquad.

Bruchia bolanderi (Bolander's candle moss) 5000'-7500'
Bolander's candle moss is known from fewer than 10 occurrences in California. It grows in meadows in mixed conifer forest from Yosemite National Park southward to the Sequoia National Forest in Tulare County. *Bruchia* occupies a specialized microenvironment within Sierran meadows. It tends to grow on vertical soil banks of small streams that meander through meadows. The closest known occurrence of Bolander's candle moss to the project area is about 2.4 miles from the krew_bul_1 management unit.

Camissonia sierrae ssp. *alticola* (Mono Hot Springs evening primrose) 4500'-8500'
Mono Hot Springs evening primrose occurs in gravelly areas associated with rock outcrops between 4000 and 9500 feet. Mono Hot Springs evening primrose is known from about 18 occurrences in Madera and Fresno Counties. Extensive populations of this plant occur in the vicinity of Florence Lake. The closest occurrence of Mono Hot Springs Evening Primrose to the eight initial management units is approximately 15.7 miles north of the glen_mdw_1 unit.

Epilobium howellii (subalpine fireweed) 6500'-8800'
Subalpine fireweed is known from meadows and seeps at approximately five sites on the Sierra National Forest in the vicinity of Huntington Lake. The species is thought to range from Sierra County at Yuba Pass to Fresno County. Potential for this species occurs in the glen_mdw_1 and krew_bul_1 units. The nearest known occurrence of subalpine fireweed is 9.7 and 17.5 miles north of these units, respectively.

Eriogonum prattenianum var. *avium* (kettle dome buckwheat) 4000'-9500'
Kettledome buckwheat occurs in gravelly areas associated with rock outcrops between 4000 and 9500 feet. It is known from about 33 occurrences, from the Sequoia National Forest up to the Minarets District of the Sierra National Forest (Fresno and Madera Counties only). The nearest known occurrences of this species are 15.3 miles northwest of providen_1, and 15.8 miles southeast of krew_bul_1.

Hulsea brevifolia (short-leaved hulsea) 5000'-9000
Short-leaved hulsea is a perennial herb. There are about 46 occurrences documented on the Sierra National Forest and others on adjacent forests and in Yosemite National Park. Short-leaved hulsea is quite abundant in some occurrences (4 occurrences have over 2000 individuals; several occurrences number over a 100 individuals) and the population overall is considered fairly robust (Clines, Tuitele-Lewis). Elevational range is 5000 to 9000 feet, from Tuolumne County south to Tulare County. Habitat for short-leaved hulsea is gravelly or sandy exposed areas as well as densely wooded sites in coniferous forest. The nearest known occurrence of short-leaved hulsea is about 1.75 miles from el_o_win_1 management unit.

Lewisia congdonii (Congdon's lewisia) 1900'-6900'
Congdon's lewisia occurs on granite or metamorphic talus, rocks, and cliffs in the Kings and Merced River drainages. This perennial herb occupies a disjunct distribution between the Kings River Canyon and the Merced River Canyon 50 miles to the north. All but one population are in the Merced River drainage. It is known from 6 occurrences. Population estimates range from < 100 plants to > 10,000. Most consist of at least several hundred plants. Plants are found on rock faces, cracks and ledges in rocky areas, on talus and scree, and on spoil piles of an abandoned barium mine. The Kings River population grows on granitics, the other populations are found on metamorphics. Plant communities range from chaparral to coniferous forest. The plant grows on the steep, seepy canyon walls of the Merced and Kings River Canyons. Potential habitat and elevational range exists for this species within the initial eight units of the project but the 6 known occurrences of Congdon's lewisia are not located within the project boundaries.

Lewisia disepala (Yosemite bitterroot) 4000'-7500'
Yosemite bitterroot occurs on granite domes from about 4400 feet to above 10,000 feet, from Mariposa County in the vicinity of Yosemite Valley, southward to Kern County. Approximately 13 occurrences of this species have been found on the Sierra National Forest. This perennial herb emerges in late winter in gravel flats and pans of granite outcrops and domes. Usually these are large, imposing geological features, but plants have also been found in small openings in pine forest where rock has yielded entirely to coarse gravel soil. Plants flower and disperse seed, and enter dormancy for the summer by early spring in many cases. Once plants have shriveled they are impossible to see, even by an experienced field botanist. This species is found in the South of Shaver unit that is covered under a separate NEPA document. The nearest known Yosemite bitterroot occurrence to the project area is about 0.5 mile north of the n_soapro_2 management unit.

Meesia uliginosa (moss) 7500'-9000'
Meesia uliginosa is also known from fewer than 10 herbarium collections in California, and from only two sites on the Sierra National Forest. It grows in saturated meadows and fens along buried logs at the upper reaches of the mixed conifer forest up to the subalpine zone. Some potential habitat for this species may occur in the krew_bul_1 unit. The nearest known occurrence of this moss to the project area is about 10 miles west of the krew_bul_1 unit.

Mimulus gracilipes (slender-stalked monkeyflower) 1500'-4225'
This monkey flower occurs in open gravelly areas in chaparral and ponderosa pine forest, often in burns and disturbed areas. It is an annual plant known from Mariposa, Tuolumne, and Fresno counties up to about 4500 feet. There are fewer than 20 known occurrences. The Jose Basin and Blue Canyon areas are known to support vigorous populations of this species. Potential habitat for this species may occur in the krew_prv_1, providen_1, providen_4, and n_soapro_2 units. The nearest known occurrence of slender-stalked monkeyflower to the project area is 2.9 miles west of n_soapro_2.

Trifolium bolanderi (Bolander's clover) 6800'-7300'
Bolander's clover occurs in montane meadows in coniferous forests, only on the Sierra National Forest and in Yosemite National Park. Bolander's clover is predictably found at about 6800 to 7300 feet (Ratliff and Denton 1993). Potential habitat for this species may occur in the Krew_bul_1 unit. The closest known occurrence to the project area is about 1.3 miles northeast of krew_bul_1.

Environmental Consequences

Alternative 1 - Proposed Action

Direct, Indirect, and Cumulative Effects to *Calyptridium pulchellum* (Federally Threatened species): No *Calyptridium pulchellum* occurrences are known to occur within the project area, but potential habitat may occur in up to three of the management units. Project design criteria are in place to protect the rocky/gravelly habitat for this species by prohibiting equipment and tree falling on rock outcrops or thin, sandy or gravelly soils. Herbicides are not to be used on shallow soils below 3800' in elevation without prior approval from the botanist, and botanical surveys are to take place before new road construction if the botanist determines that a survey in the area is necessary. Heavy equipment is to be free of soil and plant parts before being brought into a management unit, and the tocalote in the n_soapro_2 unit is to be treated before the adjacent area is disturbed by project activities. These design criteria should prevent the disturbance of *Calyptridium pulchellum* habitat by noxious weeds, which should prevent any indirect effects to the species. Because no direct or indirect effects are expected to this species, no cumulative effects to the species are expected to occur.

Direct Effects to Sensitive Plants and Noxious Weeds in General: Sensitive plants within the project area could be damaged or killed if equipment runs over them or parks on them, if logs are felled on or skidded over them, if they are trampled, if slash piles block their light, and if piles are burned directly over them and the heat intensity is too great for the plants to survive. For most of the sensitive plant species, these effects are not expected to occur, as their habitats will be protected as per the project design measures for botanical resources, aquatic resources, and watershed.

No effects of any kind are expected for unexpected larkspur, Tulare County bleeding heart, Hall's daisy, monarch golden aster, and Congdon's lewisia, which are outside of the geographical range of the species; for Tehipite Valley jewel-flower which is below the elevational range of the only unit that could be within its geographical range; and for grey-leaved violet for which suitable habitat was not found within the eight initial management units.

The noxious weed species described in the proposed action for each unit will be treated, and are expected to diminish over time as a direct result of chemical and manual control treatments. Eradication is likely for the lens-podded hoary cress in Glen_mdw_1.

Direct Effects to Sensitive Plant Species of meadows or streams: Species that occur in meadows require the maintenance of hydrologic function, and a general absence of noxious weed infestations. Because of project design measures that have been developed to protect these areas, project activities are not expected to alter hydrologic function, with one possible exception. The exception is in the Krew_bul_1 Management Unit, in the

lower end of the meadow in the far southeastern corner of T11S, R26E, section 12. This lower end of the meadow is currently threatened by active headcuts. So as not to complicate Kings River Experimental Watershed Study data readings of sediment in the affected stream, it was decided by the District Ranger in 2002 that the headcuts will not be fixed during the data gathering which was already underway when fixing the headcuts was being considered. It is possible that the headcuts will migrate to the top of this section of meadow, where the meadow narrows to bedrock. The effects of the headcuts on the meadow cannot be predicted ahead of time, but the potential exists that they could contribute to quickening the flow of water, leading to the drying of the surrounding area, and consequently altering the vegetation. Mosses and other species could then become less effective in slowing the water flow, and the meadow/fen could cease to function properly. This area has been surveyed for sensitive plants, and none were found. This lower section of meadow appears to be a fen. It is spring-fed, and supports sundews, blueberry, and sphagnum moss (these species are indicators of acidic conditions). The Sierra Nevada Forest Plan Amendment (January 2004) refers to fens as special aquatic habitats and gives the following standard and guideline for them:

Prohibit or mitigate ground-disturbing activities that adversely affect hydrologic processes that maintain water flow, water quality, or water temperature critical to sustaining bog and fen ecosystems and plant species that depend on these ecosystems. During project analysis, survey, map, and develop measures to protect bogs and fens from such activities as trampling by livestock, pack stock, humans, and wheeled vehicles. Criteria for defining bogs and fens include, but are not limited to, presence of: (1) sphagnum moss (*Sphagnum* spp.), (2) mosses belonging to the genus *Meesia*, and (3) sundew (*Drosera* spp.).

Wet meadows, riparian areas, and potential fens have been located and marked within the initial eight units. Fen surveys have not occurred but any potential fens would be included in protected areas of wet meadows. The only known conflict with the riparian standards and guidelines is with Krew_bul_1 and as previously stated, this was done in order to ensure consistent data collection. No sensitive plants or mosses were found in Krew_bul_1 and no project work resulting from Kings River Project will affect this area. It is rather an existing condition that will not be remedied in the lifespan of data collection.

Scalloped moonwort, slender moonwort, Bolander's candle moss, *Meesia triquetra*, *Meesia uligniosa*, and bolander's clover occur in meadows and most occur within the project area, though only one of these species (*Meesia triquetra*) are known to occur within the initial eight managment units. Potential habitat for these species is in wet meadows. Meadows are not expected to be impacted by project activities, with the exception mentioned above, and none of these species were found in the meadow that comprises that exception.

Subalpine fireweed could have potential habitat in the glen_mdw_1 and krew_bul_1 management units. It can occur in meadows, in which case it would not be expected to be affected by project activities, as described above. It can also occur in moist, seepy, grassy areas. These areas tend to be associated with meadows or streams, and therefore would probably be protected by buffers around these features, although a slight possibility exists that they could be disturbed. The risk is thought to be negligable,

especially as the closest known occurrence of the species is 9.7 miles miles to the north of glen_mdw_1 management unit, and 17.5 miles north of krew_bul_1 management unit.

Veined water lichen was found within the project area in the northern portion of Kings River Project, approximately .5 miles north of providen_1. The krew-bul_1 management unit is another likely unit to have veined water lichen, as it is close to a known occurrence in Teakettle Creek, just to the east of the unit. This is also the unit that received the most comprehensive surveys for the species, as it was looked for in 17 locations within the unit along the three main creeks that flow through the unit. Stream habitat is not expected to be directly disturbed by equipment (Streamcourse and Aquatic Protection, BMP 1-10). Veined water lichen is particularly sensitive to sediment increases (Davis, 1999), and some short term sediment input into creeks will occur. However, the potential for increase in sedimentation as a result of project activities is reduced by BMPs and project design measures described in Chapter 2, and habitat quality for veined water lichen is not expected to diminish. See watershed section in Chapter 3 for more information.

Direct Effects to Sensitive Plant Species of rocky outcrops: Mono Hot Springs evening primrose, Kettle Dome buckwheat, and Muir's raillardella probably do not occur within the geographic range of the project area. Potential habitat for these species, however, will be protected from equipment damage and tree felling by project design criteria.

Yosemite bitterroot was not found within the project area, but if it is present, its habitat is protected by project design criteria, by its inaccessibility, and because its general habitat (large granite domes) does not need to be treated as part of the project.

Golden annual lupine is scattered throughout the n_soapro_2 unit and is found in isolated patches in providen_1 and providen_4 management units. Its habitat is protected by project design criteria. If a few individuals of these occurrences are killed by project activities, it is not expected to lead to a trend to listing or a loss in viability of that species, given the relative abundance and vigor of the occurrences (Clines- *pers. com*. 2006; Symonds- *pers. com*. 2006). Fire is a natural component of the golden annual lupine ecosystem, and low intensity, prescribed fire is not expected to have a negative effect on the species.

Potential habitat for slender-stalked monkeyflower may occur in the krew_prv_1, providen_1, providen_4, and n_soapro_2 units. It occurs on thin soils which are partially protected by design criteria, and partially protected by the soils being too thin to support trees. Fire is a natural component of the slender-stalked monkeyflower ecosystem, and the species is throught to behave as a "fire follower" (fire annual) (Region 5 USDA Sensitive Plant Species Evaluation and Documentation Form for *Mimulus gracilipes*, 4/9/1998).

Direct Effects to Sensitive Plant Species of forest habitats: Short-leaved hulsea is a species of forest openings that could be affected by project activities. It primarily grows in openings in red fir forest, and is likely to only have potential habitat in the krew_bul_1 unit, although most of the other units have some ground within the elevational range of the species. No short-leaved hulsea was found during project surveys. Available habitat in krew_bul_1 is limited to the acres of red fir forest that were not surveyed. If individuals are disturbed in these areas, it is not expected to lead to a trend to federal listing or to a loss in viability for the species because it grows abundantly and robustly in

other parts of the Forest, and many of the areas where it is known to occur (outside of the project area) have been logged in the past (Clines *pers. com*. 2005).

Direct Effects to Sensitive Plant Species of chaparral habitat: One occurrence of carpenteria is known to occur in the n_soapro_2 unit. Further potential habitat is present in that unit. Carpenteria is partially protected by project design criteria, as well as by its natural abilities. Carpenteria sprouts back after branches are cut, and fire is highly important for its seeds to be able to germinate. If a few individuals are damaged by project activities, its near-by abundance would prevent the damage from leading to a trend to listing or a loss of viability to the plant (Clines *pers. com*. 2005).

Indirect Effects

A possible indirect effect to TES species is the degradation or loss of habitat resulting from the introduction or spread of noxious or invasive weeds. Noxious weeds are plant species that can spread rapidly and compete with native plants for water and other resources, in some cases forming solid stands of plants that may crowd out sensitive plant species. Vehicles can transport noxious weeds when equipment passes through soil in contaminated areas and carries weed seeds to new areas. Risk of noxious weed introduction and spread can be greatly reduced by cleaning all heavy equipment of soil and plant parts before bringing it onto the project site, as recommended by the USDA Forest Service "Guide to Noxious Weed Prevention Practices" (2001). Noxious weed mitigation has been incorporated as design criteria in the EA for the project.

Noxious weeds may place a higher risk to Forest Service sensitive plants of certain habitats than to those of other habitats. Those plant species of **riparian and wet meadow habitat (***Meesia triquetra*, veined water lichen, Bolander's clover**)** are at less risk from the invasive species found in the project units due to saturated conditions and elevation. Sensitive plants found in **rock outcrops and openings (**orange lupine**,** Yosemite bitterroot**,** slender-stalked monkeyflower**)** are at slightly higher risk due to the lack of canopy cover, which favors weedy species, and generally a higher disturbance factor. **Forest understory species** (short-leaved hulsea) comprises the third habitat and sensitive species found in these areas are at a low to moderate level of risk from potential invasive plants. The high amount of canopy cover generally deters weedy species, but disturbance of the canopy or forest floor can lead to the establishment of ruderal plants. Plants of **chaparral habitats (**Carpenteria**)** are perhaps at most risk to invasive plant establishment and competition due to the high availability of light and high disturbance regime that is naturally found in chaparral areas.

Soil disturbance from project activities may allow some spread of these weeds within the areas of soil disturbance, as these species are good colonizers of disturbed soil. Although undesirable, this weed spread is not expected to significantly negatively affect sensitive plants, as most known rare plant habitats will not be disturbed.

Several invasive species occur within the project area, as have been listed in the Existing Environment section of this document. Two of the weed occurrences were thought to be particularly likely to spread as a result of project activities: the bull thistle at the north end of Glen Meadow, and the tocalote in the n_soapro_2 unit. Chemical and mechanical treatment of these weeds before project activities take place has been specified in the project design criteria. Both bull thistle and tocalote infestations are to be sprayed with glyphosate unless within 100 ft of a water course, in which case they would be hand

pulled. These treatments are intended to control the spread of these weeds and in some isolated, smaller populations, eradication of those particular plants. The intent of these chemical and mechanical treatments are to decrease the risk of spread of bull thistle and tocalote, resulting from any project activities, including logging, masticating, vehicular traffic, prescribed fire, and other associated project treatments.

The lens-podded hoary cress in glen_mdw_1 is not expected to be disturbed by project activities, as it is in a relatively open area between Dinkey Creek Road and the corrals for the CPO Dinkey Creek day ride station. No project activities are planned for this area (Rojas, *pers. com*., 2004).

In most of the units where bull thistle was found (providen_1, el_o_win_1, krew_prv_1, glen_mdw_1, providen_4), it occurs in small, infrequent patches. These have potential to spread if they are disturbed, or if the ground adjacent to them is disturbed. The spread is not expected to affect sensitive plants, as no sensitive plants were found near these thistle occurrences, and the thistle does not appear to share habitat with sensitive species of rock outcrops.

Bull thistle in the bear_fen_6 unit is more extensive. It is found in several of the plantation units in the area, along roadsides, and on landings. Bull thistle in this management unit is likely to spread with project activities. No known sensitive plants occur in this area.

A roadside occurrence of Spanish broom was found in the bear_fen_6 unit. This has the potential to spread throughout the area of disturbance if the adjacent ground and canopy cover is removed.

Cheatgrass is present in scattered patches within the project area, but does not seem to be in a position to form dense stands, as it generally seems to be out-competed by other species. This is a contrast to the eastern Sierra Nevada where cheatgrass is able to form monocultures covering whole hillsides. Cheatgrass infestations are light within the project area, and have not required control efforts in the past. It was found scattered in providen_4 plantations; in glen_mdw_1 at the old sawmill site and a disturbed meadow/gully; in bear_fen_6 along 10A45; and in n_soapro_2 near the plantation in the middle of the unit. Soil disturbance and decreased canopy cover from the project activities may cause some increase in the amount of cheatgrass in the project area.

A few foxglove plants were found in n_soapro_2. These grow in moist areas and were not encroaching on the near-by golden lupine habitat.

Cumulative Effects

Cumulative effects are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7).

The 60 management units within the Kings River Project that are not covered in this document are expected to be treated over the next 30 years. Some of these units are known to have sensitive plant occurrences in them, and future surveys will be necessary to find currently unknown occurrences, guide future activities and NEPA decisions. At this time, *Bruchia bolanderi* is known from unit n_420_2; *Hulsea brevifolia* is known

from unit n_420_1; *Peltigera venosa* is known from unit n_422_2 and n_422_1; *Meesia triquetra* is known from units n_420_2, and n_421_2; *Trifolium bolanderi* is known from units n_421_2, and n_421_3; *Carpenteria californica* habitat or occurrences have been identified in units n_duff_3, n_lost_1, providen_4, n_lost_3, n_lost_4, and n_lost_2; *Lewisia disepala* is known from unit n_duff_1; and *Lupinus citrinus* var. *citrinus* is known from units n_up_big_1, n_duff_1, n_duff_2, and n_saopro_1.

No significant cumulative effects to sensitive plant occurrences are expected from past, present and foreseeable actions that will take place in and near the KRP boundary. A small number of occurrences (Table 3-20) could be at low to moderate risk from the accumulated actions of such projects. None of these occurrences are expected to be extirpated from these accumulated actions but may be reduced in number or health. In some activities, certain individual plants that were not marked or overlooked could be directly impacted; i.e. a dozer cutting line or OHV use. Other activities may cause indirect effects, such as removal of canopy or increased sedimentation in streams from equipment.

The boundary for this cumulative effects analysis was considered to be known sensitive plant occurrences located within the Kings River Project area and not for any located outside of the boundary. Monitoring of known sensitive plant occurrences within the initial eight units will be done when feasible to ensure that populations are not being affected significantly; if observations reveal that significant impact is taking place, then treatments are expected to be modified to reduce impact and subsequent effects evaluations will take this into account.

Carpenteria is also largely protected by design criteria and natural attributes. Short-leaved hulsea is not specifically protected in this project, but available habitat for it is limited, and the abundance of the species elsewhere on the Forest ensure that if individuals are damaged in this project, it will not lead to a trend to listing or loss of viability to the species. Golden annual lupine is protected through project design measures for botanical resources on rocky outcrops and shallow soils. Veined water-lichen habitat is protected by Standard and Guidelines associated with Riparian Conservation Objective (RCO) #2 and #5 in the SNFPA ROD (2004). Therefore, negative effects to sensitive plants are expected to be minimal for the Kings River Project, and should not add to any cumulative effects to sensitive plants in the project area.

Table 3-20 - Cumulative effects of projects past, present, and future on sensitive plant species in the Kings River Project area, Sierra National Forest.

Project or Activity	Description	Forest Service Sensitive plant species and number of occurrences affected by project [a]	Past, present, or future action	Expected effect on occurrences [b]
Existing road maintenance	In Kings River Project area	*Carpenteria californica* (1), *Lupinus citrinus ssp. citrinus* (1), *Mimulus gracilipes* (2), *Peltigera venosa* (1)	Past, present	Low to moderate
Vegetation management - plantation maintenance	Thinning, chemical release, planting; plantations <25	*Carpenteria californica* (1),	Past, present	Low

Project or Activity	Description	Forest Service Sensitive plant species and number of occurrences affected by project [a]	Past, present, or future action	Expected effect on occurrences [b]
	yrs			
Vegetation management	Grand Bluffs National Fire Plan- shred brush/plant conifers	*Peltigera venosa* (1)	Present	Unknown
Vegetation management	Helms/Gregg transmission line right-of-way	Possibly *Trifolium bolanderi* (No known occurrences)	Present	Low
Vegetation management	Helms/Gregg brush and small tree removal	Possibly *Trifolium bolanderi* (No known occurrences)	Past, present	Low
Roadside Hazard Tree Removal	Removal of hazard trees along roads: Strawberry, Oak, Glen, and Repeater hazard sales	Possibly *Hulsea brevifolia* or *Epilobium howellii* (No known occurrences)	Past, present	Potentially low to moderate
Prescribed fire	Underburning, maintain DFPZ's, and reduce ground fuels	Out of season burning- *Carpenteria californica* (1), *Hulsea brevifolia* (unknown)	Past, present	Low
Private Land residential development	Wildflower subdivision (Shaver Lake)	*Lewisia disepala* (1), *Lupinus citrinus* ssp. *citrinus* (4)	Past, present	Moderate
Vegetation management	SCE uneven-aged silvicultural activities	*Lupinus citrinus ssp. citrinus* (2*), Peltigera venosa* (1)	Past, present	Unknown
Vegetation management	Grand Bluffs/ Twin Ponds thinning	*Peltigera venosa* (1)	Past, present	Unknown
Vegetation management	Thinning and brush removal in Bretz and Power 1 &2	*Lupinus citrinus ssp. citrinus* (1)	Present	Low
Fuels reduction	South of Shaver-thinning, prescribed fire, brush removal	*Lupinus citrinus* ssp. *citrinus* (3), *Lewisia disepala* (2)	Present, future	Low
Motorized recreation	4x4, OHV, and snowmobile	Unknown but potentially every sensitive species found within project boundaries	Present, future	Unknown
Livestock grazing	Grazing in Blue Canyon, Dinkey, Haslett, Patterson Mt., and Thompson allotments	*Bruchia bolanderi* (1), *Carpenteria californica (2), Meesia triquetra* (3), *Mimulus gracilipes(2), Trifolium bolanderi (4)*	Present, future	Low (moderate for *Meesia triquetra* and *Bruchia bolanderi*)

Project or Activity	**Description**	**Forest Service Sensitive plant species and number of occurrences affected by project [a]**	**Past, present, or future action**	**Expected effect on occurrences [b]**
Wildlife Enhancement	Barnes South Wildlife Burn	*Mimulus gracilipes* (2)	Future	Low
Total occurrences affected by activities [c]		***Percentage of total occurrences affected***	***Estimated potential cumulative impact of activities on occurrences* (including KRP)**	
Bruchia bolanderi (1),Carpenteria californica (2), Lupinus citrinus ssp. citrinus (6), Lewisia disepala (1-3), Meesia triquetra (3), Mimulus gracilipes (2),Peltigera venosa (1), Trifolium bolanderi (2-5)		*Bruchia bolanderi* (25%),*Carpenteria californica* (24%), *Lupinus citrinus ssp. citrinus* (8%), *Lewisia disepala* (23%), *Meesia triquetra* (9%), *Mimulus gracilipes* (15%),*Peltigera venosa* (8%), *Trifolium bolanderi* (5-13%)	*Bruchia bolanderi*- moderate, *Carpenteria californica*- low, *Lupinus citrinus* ssp. *citrinus*- low to moderate, *Lewisia disepala*- low, *Meesia triquetra*- moderate, *Mimulus gracilipes*- low to moderate, *Peltigera venosa*- moderate, *Trifolium bolanderi*- low	

[a] *This includes the Kings River Project area as a whole (79 units), and only accounts for effects on documented TES plant occurrences known to exist within that boundary.*
[b] *Expected effect on sensitive plant occurrences is estimated for negative impacts; positive impacts are not listed here.*
[c] *Many sensitive plant occurrences are affected by more than one project, which is reflected in the summation of total occurrences in this column. The total occurrences, therefore, are not strictly additive across the project matrix.*

Table 3-21 - Displays the determinations for the Proposed Action and Alternative 3.

Species	Status	Determination for the Initial Eight Management Units of the Kings River Project
Calyptridium pulchellum	Federal Threatened	***no effect***
Erigeron aequifolius, Delphinium inopinum, Dicentra nevadensis, Heterotheca monarchensis, Lewisia congdonii, Streptanthus fenestratus, and Viola pinetorum* ssp. *grisea	Forest Service Sensitive	

Meesia triquetra, Meesia uliginosa, Botrychium crenulatum, Botrychium lineare, Bruchia bolanderi, Peltigera venosa, Epilobium howellii, Trifolium bolanderi, Lupinus citrinus var. citrinus, Camissonia sierrae ssp. alticola, Eriogonum prattenianum var. avium, Carlquistia muirii, Lewisia disepala, Hulsea brevifolia, Carpenteria californica, and Mimulus gracilipes	Forest Service Sensitive	***may affect individuals but is not likely to cause a trend to federal listing or a loss of viability***

Alternative 2 – No Action

Direct Effects: No Direct effects would occur to threatened, endangered, or Forest Service sensitive plants if the no-action alternative is chosen because project activities would not take place.

Indirect and Cumulative Effects: Indirect and cumulative effects have the potential to occur to TES plants if the no-action alternative is chosen. If fuels are not treated effectively in the project area, a stand replacing wildfire in the area is a possible outcome. Wildfire has the potential to cause significant disturbance to soil, ground cover, and canopy cover, placing at risk Forest Service sensitive riparian species that normally do not regenerate from high-intensity fires; additionally, carpenteria and short-leaved hulsea do not benefit and may be impacted by out-of-season burning. Fires can also allow the opportunity for the spread of invasive weeds, which can affect Forest Service sensitive species through competition of resources.

Determination for the No Action Alternative Forest Service Sensitive Plants (BE): It is my determination that the Kings River Project, No Action Alternative **will not affect** ***Botrychium crenulatum, Botrychium lineare, Bruchia bolanderi, Camissonia sierrae*** **ssp.** ***alticola, Carpenteria californica, Delphinium inopinum, Dicentra nevadensis, Epilobium howellii, Erigeron aequifolius, Eriogonum prattenianum*** **var.** ***avium, Heterotheca monarchensis, Hulsea brevifolia, Hydrothyria venosa, Lewisia congdonii, Lewisia disepala, Lupinus citrinus*** **var.** ***citrinus, Meesia triquetra, Meesia uliginosa, Mimulus gracilipes, Carlquistia muirii, Streptanthus fenestratus, Trifolium bolanderi,*** **and** ***Viola pinetorum*** **ssp.** ***grisea*** because project activities will not take place.

Alternative 3- Reduction of Harvest Tree Size

Direct, Indirect, and Cumulative Effects to *Calyptridium pulchellum* (Federally Threatened species): Similar to that of the Proposed Action; see Table 3-21.

Direct Effects to Sensitive Species: Direct effects will be similar to the Proposed Action with the following exceptions: that sensitive species of forest habitats (short-leaved hulsea) would benefit from retention of >60% canopy cover in fisher habitat outside of the WUI; plant species of riparian/special aquatic features including *Botrychium* spp., Bolander's candle moss, *Meesia triquetra*, *M. uliginosa*, subalpine fireweed, and veined water lichen would benefit from equipment exclusion within 50 feet of these features.

Indirect and Cumulative Effects to Sensitive Species: Similar to those of the Proposed Action with the exception that alteration of prescribed burns to avoid fisher denning season may impact tree anemone and short-leaved hulsea if not done in the fall.

Determination for the Reduction of Harvest Tree Size Alternative Forest Service Sensitive Plants (BE): Similar to that of the Proposed Action; see Table 3-21.

WILDLIFE

Affected Environment

There are eight Forest Service sensitive species (FSS) (California spotted owl, marten, fisher, wolverine, Sierra Nevada red fox, Northern goshawk, Great gray owl, and Pallid bat) that may be affected by activities occurring within the initial eight management units and one FSS species Townsend's big-eared bat would not be affected. Mule deer, a Management Indicator Species (MIS), are also present within the management units. For further detail on all threatened, endangered and Forest Service Sensitive species see the Biological Assessment/Evaluation (BA/BE). A specialist report has been written for MIS (Robinson 2006). Another specialist report has been written for Effects on Migratory Birds (Robinson 2006). All three documents are incorporated by reference.

If the species are identified as Threatened, Endangered or Forest Service Sensitive species, they are addressed in the Biological Assessment/Biological Evaluation as well as in the MIS Report.

Selection of Management Indicator Species to be analyzed: There are 13 Management Indicator Species or species groups that were identified in the Land and Resource Management Plan (LRMP) for the Sierra National Forest, adopted in 1992. The objective was to select species that through monitoring of populations and habitat relationships, the effects of management activities on the fish, plants, and wildlife could be evaluated.

Following is a complete list of MIS for the Sierra National Forest, broken out by the category of analysis that will be presented in this section and the type of monitoring that is required in the LRMP (USDA Forest Service 1992) (Table 3-22). Four species (Peregrine Falcon, Bald Eagle, Osprey, and Willow Flycatcher) have no habitat within the planning area or are not expected to be affected by any of the alternatives; for this reason, these species will not be addressed further.

Species with an Analysis Category of "No Habitat – No Effect" do not have habitat in or adjacent to the project area and will not be discussed further because the Kings River Project is not expected to directly or indirectly affect them; some of these species may occasionally be seen flying over the project area, however no further analysis will be performed due to the lack of supporting habitat in the project area. The two fish species groups are addressed in a separate MIS specialist report for aquatic species and the results summarized in the Aquatics Section of this chapter. Those species whose habitat is present and may be either directly or indirectly affected by the alternatives are identified as "Habitat Present – Possible Effects" and will be analyzed hereinafter. The type of monitoring required in the LRMP for each species/species group is also shown.

Under the LRMP for the Sierra National Forest, habitat and/or population monitoring is required for each of the MIS identified (USDA Forest Service 1992). The specific type of monitoring that is applicable to each species is shown in the third column of Table 3-22. This information is a summary of pages 5-6 through 5-9 of the Sierra National Forest's LRMP (specifically, Table 5.01 – Monitoring and Evaluation) that pertains to MIS.

Table 3-22 - List of MIS on the Sierra National Forest

Name of Species	Category of Analysis	Monitoring Required by LRMP
Lahontan and Paiute Cutthroat Trout (*Oncorhynchus (=Salmo) clarki henshawi* and *O. c. seleniris*)	Addressed in aquatic MIS specialist report	Habitat
Resident Trout – brown trout, Eastern brook trout, and rainbow trout (*Salmo trutta*, *Salvelinus fontinalis*, and *Oncorhynchus mykiss*)	Addressed in aquatic MIS specialist report	Habitat Populations
Northern Goshawk (*Accipiter gentiles*)	Habitat Present – Possible Effects	Habitat
Peregrine Falcon (*Falco peregrinus*)	No Habitat – No Effect	Population
Bald Eagle/Osprey (*Haliaeetus leucocephalus*/*Pandion haliaetus*)	No Habitat – No Effect	Populations
California Spotted Owl (*Strix occidentalis occidentalis*)	Habitat Present – Possible Effects	Populations
Willow Flycatcher (*Empidonax traillii*)	No Habitat – No Effect	Populations
Mule Deer (*Odocoileus hemionus*)	Habitat Present – Possible Effects	Populations
Riparian Avian Species	Habitat Present – Possible Effects	Populations
Oak Woodland Avian Species	Habitat Present – Possible Effects	Populations
Meadow Edge Avian Species	Habitat Present – Possible Effects	Populations
Mature Mixed-Conifer Avian Species	Habitat Present – Possible Effects	Populations
Pacific Fisher/American Marten (*Martes americana*/*Martes pennanti pacifica*)	Habitat Present – Possible Effects	Populations

Species Presence: The following is a summary of species known to occur within the eight initial management units and included in the analysis:

- **Bear_fen_6** - There are three Protected Activity Centers (PACs) (FR130, FR160 and FR161) for the California spotted owl within the management unit boundary. All three PACs are within the California spotted owl study (owl study) conducted by Pacific Southwest Research station (PSW). There are fisher and goshawk sightings. There is also research that has been conducted in this unit from Jordan and Mazzoni's work. Mazzoni (2002) did live-trapping and attached radio transmitters. Jordan and others (2005) did camera traps and genetic tagging of hair samples. There is also a goshawk PAC (SIEGH10) within the management

unit boundary. There is one deer holding area (Oak Flat #12) within the management area and a few migration corridors.

- **El_o_win_1** - There are two PACs (FR027 and FR162) within the management unit. FR162 is within the owl study conducted by PSW. There is also research that has been conducted in this unit from Jordan and Mazzoni's work. Mazzoni (2002) did live-trapping and attached radio transmitters. Jordan and others (2005) did camera traps and genetic tagging of hair samples. There is a historical pair of nesting goshawks and a PAC SIEGH6 has been delineated for the area. There is a deer population center (Dinkey #13) and deer holding area (BigFir-Dinkey-Lower Dinkey #11) within the management unit.
- **Glen_mdw_1** - There is one PAC (FR039) within the management unit. FR039 is within the owl study conducted by PSW. There are fisher and goshawk sightings within the unit. There is also research that has been conducted in this unit from Jordan and Mazzoni's work. Mazzoni (2002) did live-trapping and attached radio transmitters. Jordan and others (2005) did camera traps and genetic tagging of hair samples. FR039 is within the owl study conducted by PSW. There is a portion of deer holding area #10, Blue Canyon-Providence and migration corridors within the management unit.
- **Krew_bul_1** - There is one Home Range Core Area (HRCA) (FR188) for the California spotted owl within the management unit. There are migration corridors for mule deer within the unit.
- **Krew_prv_1** - There are two PACs (FR021 and FR122) for the California spotted owl within the management unit boundary. FR122 is within the owl study conducted by PSW. There are incidental sightings of bald eagle, goshawk, great gray owl, marten and fisher. There is also research that has been conducted in this unit from Jordan and Mazzoni's work. Mazzoni (2002) did live-trapping and attached radio transmitters. Jordan and others (2005) did camera traps and genetic tagging of hair samples. There are two deer holding areas (Summit #9 and Blue Canyon-Providence #10) within the management unit and a few migration corridors.
- **N_soapro_2** - There is one PAC FR167 for the California spotted owl within the management unit. It is within the owl study conducted by PSW. There is also research that has been conducted in this unit from Jordan and Mazzoni's work. Mazzoni (2002) did live-trapping and attached radio transmitters. Jordan and others (2005) did camera traps and genetic tagging of hair samples.
- **Providen_1** - There are two PACs, FR119 and FR147 for the California spotted owl within the management unit. PAC 119 is within the owl study conducted by PSW. There are incidental sightings of goshawk and fisher. There is also research that has been conducted in this unit from Jordan and Mazzoni's work. Mazzoni (2002) did live-trapping and attached radio transmitters. Jordan and others (2005) did camera traps and genetic tagging of hair samples. There is a portion of a deer holding area (Summit #9) and a few migration corridors within the management unit.
- **Providen_4** - There are no PACs for the California spotted owl within the management unit. There is also research that has been conducted in this unit from Jordan and Mazzoni's work. Mazzoni (2002) did live-trapping and attached radio transmitters. Jordan and others (2005) did camera traps and genetic tagging of hair samples. There is a small portion of winter range and migration corridors for the deer.

Environmental Consequences – All Alternatives

This section summarizes analyzes of the effects of the three alternatives on nine FSS and the Sierra NF MIS terrestrial species and their habitats. The effects of the alternatives are discussed in terms of their direct, indirect, and cumulative impacts. Only a brief discussion is presented in this section for each of the alternatives. More detailed information can be found in the BA/BE and the Management Indicator Species Specialist

Report – Kings River Project (Robinson 2006) which are incorporated by reference. Animations of spotted owl and fisher habitat before and after initial treatments based on Parks and Rojas 2006 are provided on the Sierra National Forest website: http://www.fs.fed.us/r5/sierra/projects/

There were two significant issues detailed in Chapter 1 that relate to terrestrial species:

1) the use of herbicide/surfactant will create an adverse risk of harmful effects to people and wildlife (issue #2);

2) the proposed action will threaten the viability and cause degradation of habitat of the spotted owl, marten, fisher, and goshawk and will lead to high short-term risks on aquatic management (issue #3).

In Table 3-23 through 3-25 are a summary of habitat acres by CWHR size and density class showing habitat currently and directly after treatment by either Alternative 1 or Alternative 3.

Table 3-23 - Current CWHR habitat acreage, Alternative 1 without wildfire

Alternative 1 no fire									
Year	Current								
Sum of ACRES	PROJECT								
b_cwhr	bear_fen_6	el_o_win_1	glen_mdw_1	krew_bul_1	krew_prv_1	n_soapro_2	providen_1	providen_4	Grand Total
3D	51	10	9	10	71	386	140	31	709
3M	2	5		1	1	33	40	30	113
4D	506	535	66	39	509	563	648	472	3,338
4M	1,256	567	946	427	1,043	247	501	293	5,280
5D		6			6	20	25	21	77
5M	72	15	132	47	29	3	28	31	355
Grand Total	1,887	1,138	1,153	524	1,659	1,251	1,383	878	9,873

Table 3-24 – CWHR habitat acreage directly after proposed action, Alternative 1 without wildfire

Alternative 1 no fire after									
Year	Directtly after proposed action								
Sum of ACRES	PROJECT								
a_cwhr	bear_fen_6	el_o_win_1	glen_mdw_1	krew_bul_1	krew_prv_1	n_soapro_2	providen_1	providen_4	Grand Total
3D	24	7	9	10	66	383	110	31	641
3M	28	3			1	31	60	49	173
4D	385	340	26	15	211	552	463	389	2,382
4M	1,173	672	892	327	1,197	205	577	313	5,356
5D						18	15	4	36
5M	64	23	131	8	40	3	55	37	361
Grand Total	1,674	1,047	1,058	361	1,516	1,191	1,279	824	8,949

Table 3-25 – CWHR habitat acreage directly after treatment, Alternative 3 without wildfire

Alternative 3 no fire									
Year	Directly after treatment								
Sum of ACRES	PROJECT								
a_cwhr	bear_fen_6	el_o_win_1	glen_mdw_1	krew_bul_1	krew_prv_1	n_soapro_2	providen_1	providen_4	Grand Total
3D	24	7	9	10	66	366	110	31	624
3M	28	3			1	31	60	49	173
4D	391	348	34	15	231	569	461	410	2,460
4M	1,167	665	879	335	1,176	205	593	307	5,327
5D	19					18	15	4	56
5M	44	23	136	12	44	3	55	44	360
Grand Total	1,674	1,047	1,058	373	1,519	1,191	1,293	844	8,998

There is a minimal difference between the two action alternatives for wildlife species; therefore, they are discussed together in this section. The main difference is the protection measures listed from technical advice by US Fish and Wildlife Service (F&WS) for the fisher and Yosemite toad.

California Spotted Owl, FSS and MIS

General Information

Stand treatments may directly affect owls in any of three areas of primary behavior: nesting and roosting, foraging, and dispersal. Typical buffers applied to known owl sites protect owls from most direct impacts and are likely to minimize disturbance. It is not known, however, how stress may affect owls. Although they may not flush from a site, continued disturbance in the area may trigger stress responses that could increase foraging time or decrease foraging efficiency and disturb typical behavioral patterns.

A limited operating period and limitations on activities in the WUI threat zone in the design measures for California Spotted Owl are incompatible with the California Spotted Owl Study (CSOS) as described in the Design Measures section of Chapter 2. The study is designed to treat some protected activity centers (PAC) using the management direction for the defense zone of the WUI from the SNFPA Record of Decision of 2001 in whatever land allocation the PAC are located. The design measures for the WUI threat zone would be more limiting and the limited operating period would not allow for concentrating the effects in time so they would not be applied within the CSOS. Inherently, the study would determine the effects of treatments specified in the design

To some extent, the same limited operating period is incompatible with the KREW Studies in Management Units krew_bul_1 and krew_prv_1. The KREW Studies require the activities intended to address several questions posed in the SNFPA 2004 Record of Decision to take place in as few years as possible to concentrate the effects in time and provide the greatest opportunity for accomplishing the objectives of the Studies. Without the limited operating period the direct effects may be prolonged noise disturbance which could increase or decrease foraging efficiency and disturb typical behavioral patterns as

mentioned above or if the owls are nesting, they may leave the area or fail at nesting attempts.

Evaluative Criteria

The action alternatives will be analyzed against the criteria shown in Table 3-26. These criteria were chosen to clearly display and quantify effects to the California Spotted Owl and its habitat; and to address elements critical to the owl's viability.

Table 3-26 - Criteria used to evaluate and measure effects on the California Spotted Owl and its habitat resulting from implementation of the action alternatives.

Evaluative Criterion	How it Will be Measured
Total suitable habitat acres in planning area	Figures for current condition will be compared to estimated numbers post-project and for 10, 20, and 30 years after project implementation
Acres of suitable habitat within PACs	Figures for current condition will be compared to estimated numbers post-project
Percent of California Spotted Owl home range containing suitable habitat	Figures for current condition will be compared to estimated numbers post-project; threshold of 30-50% based on Bart (1995)
Percentage of 1000 acres surrounding PACs that contain canopy cover of greater than 40%	Figures for current condition will be compared to estimated numbers post-project; threshold of 44% representing optimum conditions is based on Lee and Irwin (2005)
Effects of Stand Replacing wildfire	Effects of Stand Replacing fire will be displayed for all alternatives, starting with present-day conditions and ranging 30 years into the future
Five factors under Section 4(a)(1) of the ESA comprising threats which may contribute to a species being listed as Threatened or Endangered	Whether the cumulative effects are within the scope of effects described in the USFWS' 12-month finding (U.S. Dept. of Interior 2006)

Direct Effects to California Spotted Owl

Silvicultural and Hazardous Fuels Reduction Treatments: Wolcott (2006:36-41) summarized direct effects such as noise or fire/smoke disturbance, availability of nest trees, canopy cover, and dispersal resulting from proposed (Alternative 1) silvicultural and hazardous fuels reduction treatments; those descriptions of effects are hereby incorporated by reference. Under Alternative 3, these effects would be slightly reduced in scope and magnitude because: the uneven aged management strategy is modified to reduce vegetation treatments to trees 30" dbh and smaller; protection measures for the Pacific fisher are adopted; and all treatments outside of the research areas will be consistent with the standards and guidelines in the SNFPA ROD (USDA 2004).

Total Suitable Habitat Acres in Planning Area: Currently, 47,464 acres of suitable California Spotted Owl habitat exist within the planning area, of which 9051 are within the initial eight management units. Under Alternative 2, the amount of suitable habitat in the planning area could increase to over 57,000 acres in 30 years assuming no wildfires occurred during that time. Implementation of Alternatives 1 or 3 would result in suitable habitat increasing to about 56,500 acres or more in 30 years, again assuming no wildfires occurred during that time period (Table 3-27). Based on this analysis alone, it may appear that the alternatives do not differ considerably in overall effects on the California Spotted Owl. However, it is reasonable to assume one or more wildfires could occur within the planning area, perhaps as early as within the next 10 years. Taking this into account

substantially changes the impacts of the various alternatives on the California Spotted Owl and its habitat. The effects of such a fire event are modeled below in a later section titled, Effects of Stand Replacing Fire.

Table 3-27 - Total suitable habitat acres for the California Spotted Owl within the planning area under all alternatives.

Alternative	Time Frame	Acreage Total	
		Initial Eight Mgmt Units	Planning Area
NA	Current	9051	47,464
1	Post-Project	8135	46,549
	10 Years After	8914	51,476
	20 Years After	9364	54,595
	30 Years After	9893	56,555
2	Post-Project	----	47,464
	10 Years After	----	52,632
	20 Years After	----	55,753
	30 Years After	----	57,598
3	Post-Project	8202	46,615
	10 Years After	9030	51,592
	20 Years After	9421	54,652
	30 Years After	9938	56,600

Acres of Suitable Habitat within PACs: The 300-acre size of Protected Activity Centers is derived from a sample of 148 California Spotted Owl nest trees in the Sierra Nevada; analysis of these data showed that the mean size of stands containing nest trees was about 100 acres and that the mean cumulative size of each nest stand plus all adjoining stands that were in "Selected" strata[9] was about 300 acres (Verner *and* others 1992). Nesting sites, one or more suitable roost sites, and areas supporting a substantial portion of the owl's foraging activities are all found within the activity center (Verner *and* others 1992: 87).

Because of the important role that PACs play in the life history of the California Spotted Owl, we displayed the amount of suitable habitat currently within PACs compared to the amount of such habitat that would be present immediately after implementation of the action alternatives (Table 3-28). Of the 11 PACs in the project area, six would be affected by the proposed treatments as part of the Spotted Owl study. Loss of habitat across all PACs would range from one acre up to 36 acres per individual PAC, with an average loss of 6.6 acres of suitable habitat. The amount of suitable habitat would not change under the proposed activities (Alternatives 1 and 3) for five PACs. The reader should note that PAC FR122 currently has 162 acres on Forest Service lands (of which 138 is suitable); the remaining 143 acres is on private land.

Because of the uncertainty involved in estimating, with precision, the amount of suitable habitat that would be present within PACs over a period of 10 years or longer, we did not attempt to display habitat totals for PACs for the 10- to 30-year period following implementation of the proposed action.

[9] Selected strata refers to a timber type used equal to or greater than its availability.

Percent of California Spotted Owl Home Ranges Containing Suitable: Nine of the 12 owl home ranges analyzed herein contain more than 50% suitable habitat; and all of them contain more than 30% suitable habitat. Only one of the home ranges (owl FR021) drops below 50% suitable habitat as a result of the proposed treatments in Alternatives 1 or 3. No home range would drop below 30% suitable habitat in Alternatives 1 or 3. Based on Bart's (1995) findings, the capability for owls to replace themselves exists throughout the entire project area, and that condition would be maintained under both action alternatives. The amount of habitat available to owls FR122, FR167, and FR119 is close to (but not below) the threshold defined by Bart (1995). All of these calculations were made based on the assumption (U.S. Dept. Interior 2003:7589) that home range size for owls on the Sierra National Forest is 2500 acres (Table 3-28).

Because of the uncertainty involved in estimating, with precision, the amount of suitable habitat that would be present within individual home ranges over a period of 10 years or longer, we did not attempt to display habitat totals for home ranges for the 10- to 30-year period following implementation of the proposed action.

Table 3-28 Changes in the percent of suitable habitat within California Spotted Owl home

PAC ID Number	Current Conditions (No Action – Alt 2)		Proposed Action (Alt 1) Post Project		Alternative 3 Post Project	
	Total Acres	% Suitable	Total Acres	% Suitable	Total Acres	% Suitable
FR130	1627	65.1%	1451	58.0%	1451	58.0%
FR160	1416	56.6%	1319	52.8%	1319	52.8%
FR161	1628	65.1%	1459	58.4%	1459	58.4%
FR027	1353	54.1%	1312	52.5%	1312	52.5%
FR162	1993	79.7%	1917	76.7%	1917	76.7%
FR039	1610	64.4%	1497	59.9%	1497	59.9%
FR021	1297	51.9%	1158	46.3%	1161	46.4%
FR122	1055	42.2%	998	39.9%	1017	40.7%
FR167	942	37.7%	899	36.0%	909	36.4%
FR119	1175	47.0%	1104	44.2%	1104	44.2%
FR147	1266	50.6%	1262	50.5%	1262	50.5%
FR188	1293	51.7%	1292	51.7%	1292	51.7%

Percentage of 1000 Acres Surrounding PACs That Contain 40% or Greater Canopy Cover: Verner and others (1992:158) recommended that suitable habitat include the criterion of canopy closure greater than or equal to 40% based on habitat use studies which showed that such habitat was used by many California Spotted Owls more than expected relative to its availability across the landscape.

Optimum conditions for reproduction in California Spotted Owls may exist when at least 44% of the 430-ha (1063 ac) area surrounding the territory center contains forested habitat with canopy cover greater than 40% and a suitable nest tree is present in the activity center (Lee, *in litt*. 2005; Lee and Irwin 2005).

Because of the importance that this metric appears to play in the viability of California Spotted Owl populations, we displayed the percentage of the 1000 acres surrounding the PAC that contains forested habitat with greater than 40% canopy closure; these data are reflected for current conditions and for the period immediately after implementation of the proposed activities (Table 3-28). In brief, more than 44% of the 1000 acres

surrounding all owl sites currently contain forested habitat with > 40% canopy closure and that condition would be maintained under both action alternatives, with the exception of owls FR122 and FR167. Both Owl FR122 and FR167 are slightly below the threshold defined by Lee and Irwin (2005), and so the potential for successful reproduction may be at risk at these sites. Based on the data concerning forested habitat with >40% canopy cover the potential for reproduction continues at all of the remaining nine sites.

Because of the uncertainty involved in estimating, with precision, the amount of forested habitat with greater than 40% canopy cover that would be found within the 1000 acre circle surrounding activity centers over a period of 10 years or longer, we did not attempt to display habitat totals for this metric for the 10- to 30-year period following implementation of the proposed action.

Indirect Effects to California Spotted Owls

Silvicultural and Hazardous Fuels Reduction Treatments: Wolcott (2006:38, 41-43) summarized how prey, the in-growth of larger, suitable nesting trees, and the probability of stand-replacement fire events taking place would be indirectly affected by the alternatives; those descriptions of effects are hereby incorporated by reference. The indirect effects of silvicultural and hazardous fuels reduction treatments to the California Spotted Owl under Alternative 3 are expected to be similar as those described by Wolcott (2006) for Alternative 1 since the only key differences between the alternatives are: reducing vegetation treatments to trees 30" dbh and smaller; adopting protection measures for the Pacific fisher; and making all treatments outside of the research areas consistent with the standards and guidelines in the SNFPA ROD (USDA 2004).

Under Alternative 2, if no action is taken and a wildfire occurred in the area, there would be greater effects of the habitat loss because it would be harder to control due to dense ladder fuels and high surface fuel loading that is currently in the area. Tree density would remain high and present continued effects of crown fire (see Fuels section of this chapter). As a result of the No Action Alternative, stands would have higher tree density, and less growing space; therefore, leading to smaller diameter clumped trees, less foraging and nesting habitat, and restricted flight space.

Effects of Stand Replacing Fire: As described in the Environmental Impact Statement, each Alternative incorporates the concept of wildfire entering one or a couple of the initial eight management units ten years after the record of decision. Fire records for the KRP indicate it is likely one or a couple of the management units could be significantly affected by a stand replacing fire on a hot windy summer day, but it is unlikely numerous management units or an entire watershed would be affected at one time. There would be a greater loss of habitat if no treatments occur because the trees are denser and there is a higher likelihood of a stand replacing fire destroying habitat within the wildfire.

It is easier to demonstrate this by assuming all eight management units burn over the span of a few years as shown in Figure 3-50. It could be argued that it is unlikely all eight management units would burn within a few years; however, the depiction of the impacts in this manner is intended to simplify the reader's interpretation of the data by creating an index which merely shows that regardless of the amount of fire that occurs over time,

there would be a greater loss of habitat if no treatments occur versus implementing the treatments called for in the action alternatives, all other things being equal.

Immediately after wildfire, there would be approximately 7200 acres of spotted owl habitat remaining with the action alternatives (Alternative 1 and Alternative 3) versus 2900 acres for Alternative 2. The best scenario among the alternatives is to implement Alternative 1 or Alternative 3 because it reduces the effects of fire and after 30 years there would be approximately 8100 acres, if wildfire occurs (and approximately 9400 acres, if no wildfire occurs) of spotted owl habitat in the initial eight management units.

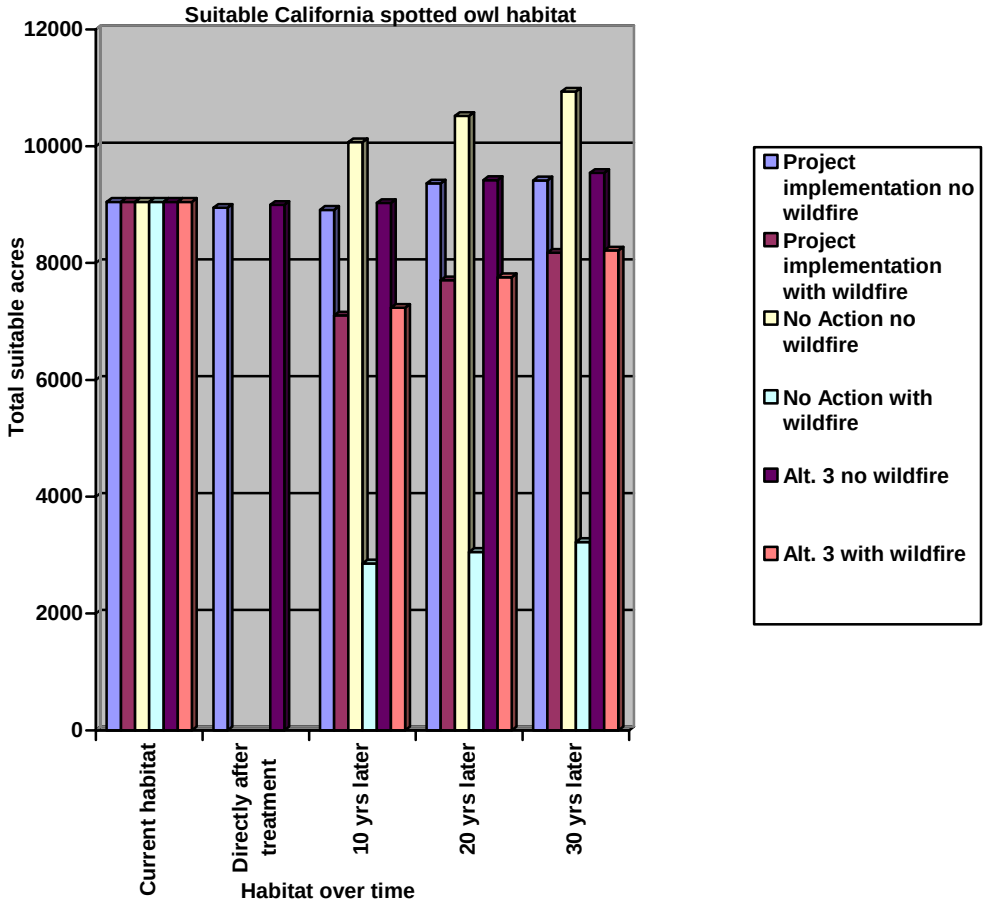


Figure 3-50 - Suitable Spotted Owl Habitat

Cumulative Effects for California Spotted Owl

In general, the area considered in determining the cumulative effects of the proposed action is bounded by the San Joaquin River on the north, the Kings River on the south, and the elevation range for Spotted Owls on the east and west. This area is appropriate for analysis of cumulative effects, because the total size of the KRP (approximately 131,500 acres within two watersheds of the Kings River drainage) is considered sufficient to facilitate replication of experiments and also "represents the heterogeneity of southern Sierra ecosystem types" (USDA Forest Service 2004:81). Wilderness areas and national park land, where limited land management occurs, further define the boundary

on the east. The two rivers course through steep, rugged canyons that are dominated by chaparral or rock at lower elevations, have no habitat, and are inhospitable (although by no means impenetrable barriers) for north to south movement. Depending on the scale of analysis, the boundary for cumulative effects as described above may be enlarged or condensed as necessary.

At a larger scale, human population growth and increasing use of wild land areas may affect the California spotted owl and its habitat, including activities such as California's fast growing (1982-1995) recreational activities such as OHV use, (+44%), hiking (+94%), backpacking (+73), and primitive camping (+58%).

Again at the larger scale, over the past 28 years, timber harvest from Federal lands in California has declined from 1,725 MMBF in 1978 to 230 MMBF in 2005 (average of 906 MMBF) (Board of Equalization 2005). 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 1,495 MMBF in 2005 (average of 2,028 MMBF). An upward trend in these numbers in the near future would further fragment habitat on private land. Declines in timber harvest affect the owl in several ways. Declining harvest frequently means fewer disturbances in the woods and a greater opportunity that any given owl will breed and fledge its young without substantial interference or disturbance. On the other hand, declining timber harvest also reduces the available funds for forest restoration and habitat management.

Present and reasonably foreseeable activities were described at the beginning of Chapter 3 of the KRP Environmental Impact Statement and are listed, in part, in Table 3-2. In addition to the site-specific analysis of the eight management units, the EIS includes an analysis of the cumulative effects of establishing 10 management units as no treatment-controls, and the treatment of one unit (South of Shaver) under an existing decision.

The ongoing federal management activities (all of which have already had their NEPA completed) that extend in time through the treatment of the initial eight management units and overlap them involve the High Sierra Ranger District prescribed burn program of work (Figure 3-2, Chapter 3 of the FEIS), other Sierra National Forest timber and culture projects (Figure 3-2, Chapter 3 of the FEIS), active cattle allotments (Figure 3-3, Chapter 3, FEIS), and recreational activities and events (e.g. off-highway vehicle (OHV) and off-snow vehicles (OSV); (Figure 3-4).

The ongoing privately managed activities (Figure 3-5) within the Kings River Project area involve two timber sales near the n_soapro_2 management unit, a housing development north of the sos_1 management unit, Southern California Edison (SCE) timber management area, other non-industrial forest landowner thinning, and the Pacific Gas & Electric (PG&E) transmission line.

At a forest-wide scale, there currently are 321 designated Home Range Core Areas and 258 Protected Activity Centers encompassing over 113,000 acres. Over 450,000 acres of suitable habitat currently exist on the Forest. Considering the proposed activities, ongoing actions, and reasonably foreseeable activities, less than one percent of suitable habitat on the Sierra National Forest would be adversely affected.

Since about the mid 1960s, past activities have included clearcutting and salvage logging (1960s to 1972), sanitation and salvage harvests (1972 through 1978), clearcutting, shelterwood cutting, and salvage harvests (1978 through 1992), and commercial thinning

and salvage in recent times. The only fires to burn substantial amounts of timber were the Rock Fire in 1981 and the Big Creek Fire in 1995, with each fire burning about 3000 acres of forest. Clearcuts or burned areas that took place prior to 1972 are most likely successful plantations today exhibiting "size class 3" and density "class M" stands. Other, more recent disturbances, while they may be reforested have probably not yet reached "size class 3". Overall, about 9000 acres of disturbance resulting from timber sale activity or fires have taken place within the KRP planning area and approximately 23,000 acres of disturbance have been documented for the larger area encompassing the Kings River and Pine Ridge Ranger Districts (now known as High Sierra Ranger District) since about 1972 (Smith, *pers. comm.*2006). Although these disturbances have caused notable changes in wildlife habitat, the amount of these changes over the last 30 years is not extraordinary compared to the total amount of suitable Spotted Owl habitat that is available: i.e., over 450,000 acres across the Forest, and 47,464 acres within the KRP planning area.

The ROD for the SNFPA FSEIS amends the Sierra National Forest LRMP and incorporates the Kings River Project (USDA 2004:p. 15 of ROD; pp. 81-82 of FSEIS). As mentioned in the KRP DEIS, the intention of the SNFPA ROD was to allow existing studies and research projects such as the KRP to continue even though it might result in deviation from direction specified in the SNFPA ROD. In summary, the KRP direction may include variations of: a) the SNFPA ROD "Appendix A: Management Direction" described in the design measures in this proposal or subsequently in the EIS alternatives and associated mitigation measures; b) the remaining unmodified "Appendix A: Management Direction"; c) the SNFPA ROD land allocations; and d) the remaining operational LRMP standards and guidelines.

In its 12-month finding in which it decided to not list the California Spotted Owl as Threatened or Endangered, the USFWS concluded that the scale, magnitude, or intensity of effects on the California Spotted Owl resulting from fire, fuels treatments, timber harvest, and other activities did not rise above the threshold necessitating protection of the species under the Endangered Species Act (U.S. Dept. of Interior 2006). The USFWS reached this conclusion after considering the impacts of the Forest Service's implementation of the SNFPA ROD, which includes the KRP as proposed and described herein. The USFWS' (U.S. Dept. of Interior 2006) conclusion is supported by:

Data which indicate that California Spotted Owl populations in the Sierra Nevada are stable and comprise 81% of the species' known territories

The anticipation that current and planned fuels-reduction activities throughout the range of the species will have a long-term benefit by reducing the effects of stand replacing wildfire; these activities embrace those described by the SNFPA ROD, including implementation of the KRP

Barred Owls represent only about 2% of California Spotted Owl numbers in the Sierra Nevada

Protection measures are being implemented for the California Spotted Owl on private lands, including the largest private landholder within the range of the species.

Based on the above analysis, the activities proposed in the KRP are within the scope of effects considered and described by the USFWS in its 12-month finding to not list the

California Spotted Owl. As a result, the KRP would not result in any cumulative effects that are greater than those already analyzed by the USFWS when it determined that listing of the California Spotted Owl as Threatened or Endangered is not warranted at this time. For all of these reasons, viability of the owl in the KRP planning area is not a concern.

Great Gray Owls, FSS and Northern Goshawk, FSS and MIS

Direct and Indirect Effects to Great Gray Owls and Northern Goshawk

In the initial eight management units, great gray owls have been sighted in only one unit (KREW_prv_1) but goshawks occur in five of the eight units. The great gray owls utilize the project area for foraging. The nearest area where great gray owls have been known to nest is east of the KRP where they are utilizing a meadow on private land. In addition to the sightings of goshawks, they are nesting in the bear_fen_6 and el_o_win_1 management units. When trees are being removed with mechanical equipment (tractor, masticator, etc.) there may be a direct effect due to the noise disturbance involved with project activities. Short term disturbance may occur from prescribed fire because the birds may leave the area due to smoke or noise disturbance associated with the activities. The long term effects are a benefit to the species because high quality nesting habitat will be created when the smaller trees are removed which in turn will allow growing space for medium and large size trees.

If the action alternatives are implemented and there is a wildfire the habitat for these birds will decrease after the fire then recover through a ten year period and what was lower quality habitat will move toward higher quality habitat. A wildfire under any alternative results in habitat loss. However, more habitat is lost if Alternative 2 (No Action) is selected and a wildfire occurs, all other things being equal. Under Alternative 2 without wildfire there would be more habitat over time, but this scenario is unlikely. Model results in the Fuels and Vegetation Sections of this chapter indicate that under the no action alternative the occurrence of wildfire would lead to substantial loss of habitat.

Smoke from either a wildfire or prescribed fire could move into the area where the birds are nesting or foraging and they could potentially leave the area for a while and return at a later time. The affects to prey species for goshawk would be they may be killed through the fire if they do not leave the area. Those that leave the area and return would have higher quality habitat in the long run. The great gray owl's prey base is primarily within the meadow; therefore, there would not be an effect to them because meadows are not included in prescribed burns.

A limited operating period for goshawk is incompatible with the KREW Studies in Management Units krew_bul_1 and krew_prv_1. The KREW Studies require the activities intended to address several questions posed in the SNFPA 2004 Record of Decision to take place in as few years as possible to concentrate the effects in time and provide the greatest opportunity for accomplishing the objectives of the Studies. Without the limited operating period the direct effects may be prolonged noise disturbance which could increase or decrease foraging efficiency and disturb typical behavioral patterns.

Currently, 585 acres of suitable habitat for great gray owl exist in the KRP planning area. Implementing Alternative 1 or Alternative 3 would result in a minor loss of suitable habitat. This short-term loss of habitat is offset by the benefit of a greater reduction in wildfire effects over the long-term, compared to the Alternative 2.

The following chart shows the affect of the alternatives with and without a wildfire occurring on goshawk habitat over time.

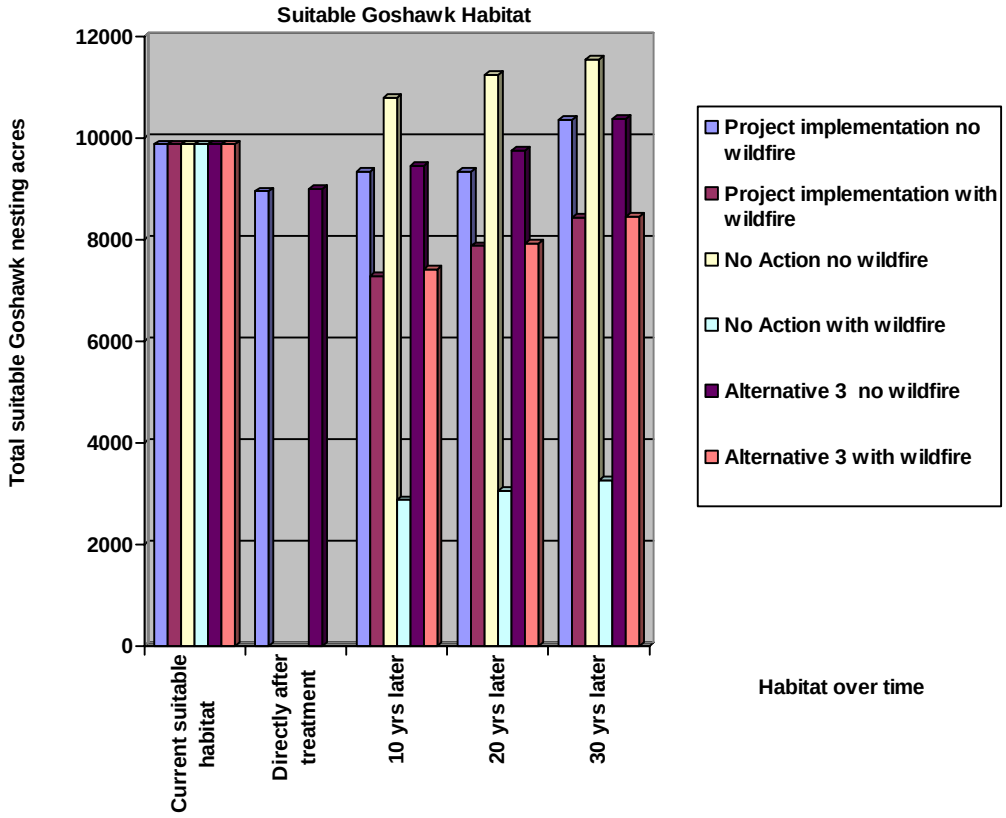


Figure 3-51 - Goshawk habitat effects of implementing the alternatives

Currently, 50,300 acres of suitable habitat for goshawk exist in the KRP planning area. Implementing Alternative 1 or Alternative 3 would result in a loss of about 900 and 880 acres of suitable habitat, respectively. This short-term loss of habitat is offset by the benefit of a greater reduction in wildfire effects over the long-term, compared to the Alternative 2 (see Figure 3-51).

As seen in the Figure 3-51, when no wildfire occurs the suitable habitat increases over time. Alternative 2 without wildfire is unlikely because, as stated before, it is only a matter of time before a wildfire occurs. The area shows a high fire hazard due to fuels on the ground and the high tree density. As a result of the No Action Alternative, stands would have higher tree density, and less growing space; therefore, leading to smaller diameter clumped trees, less foraging and nesting habitat, and restricted flight space.

Cumulative Effects for Northern Goshawk

The Northern Goshawk has a continuous distribution throughout the Sierra Nevada with a network of 50 managed territories on the Sierra National Forest. Given the scope and scale of the Kings River Project relative to the size of the Sierra Nevada and the goshawk's overall North American distribution, the area considered in determining the cumulative effects of past, present, and reasonably foreseeable activities on the Northern Goshawk will focus on the Sierra NF. Based on the following analysis, a determination of viability for the Northern Goshawk will be made.

Two Northern Goshawk territories are located within the KRP area, and they are in the following locations: (1) SIEGH10 in the Bear Fen 6 unit, and (2) a PAC (SIEGH6) in the El O Win unit.

Current and post-treatment suitable habitat acres for two Northern Goshawk territories

	Territory SIEGH10	Territory/PAC SIEGH6
Current suitable habitat acres	178	164
Post-treatment suitable habitat acres	149	142

Biological Evaluations for many of the past projects in the Sierra NF were reviewed to help inform the present analysis. Our review of these documents revealed the following basic information about effects to Northern Goshawks from these activities:

- Twenty-six (26) total project Biological Evaluations (BEs) were reviewed, dating back to 1993 on the Sierra NF.
- Determinations reached were:
    - No effect – 4 BEs
    - May affect individual goshawks, but not likely to lead to a trend toward federal listing or loss of viability – 20 BEs
    - May affect individual goshawks, and likely to lead to a trend toward federal listing or loss of viability – 0 BEs
    - Northern Goshawk was not addressed in the document we reviewed due to lack of habitat or other reasons – 2 BEs
- Types of Projects: Fuels reduction, harvest, hazard tree removal, thinning, and underburning were the proposed activities that were most often represented in the sample of BEs in which the Northern Goshawk was analyzed.
- Relative to "May Affect" projects, the described impacts to Northern Goshawks most often fell in the following categories:
    - Noise disturbances
    - Loss of foraging area if underburn gets out of control
    - Loss of plucking trees
    - Habitat quality reduction
    - A 210-acre reduction in canopy cover in the KRP area
    - A 1230-acre reduction in canopy cover on the Sierra NF

Additional past, present, and reasonably foreseeable future activities are outlined at the beginning of Chapter 3 of the Kings River FEIS. Two of these projects would result in a 210-acre reduction in canopy cover at the KRP level: (1) Jose 1 project (60 acres converted from 4M to 4P and 8 acres converted from 3M to 3P), and (2) South of Shaver Project (122 acres converted from 4M to 4P and 20 acres converted from 4D to 4M).

Currently, there are 405,000 acres of suitable goshawk habitat in the 4000 to 8,000 foot elevation range on the Sierra NF; 50,000 acres of that total are within the KRP area.

The cumulative effects described for the fisher under the headings, "**A review of the fire history dating back to 1916**" and "**A review of how past activities since about the mid-1960s have affected the landscape**" apply to the goshawk as well. Although these disturbances have caused notable changes in wildlife habitat, the amount of these changes over the last 30 years is not extraordinary compared to the total amount of suitable goshawk habitat that is available: i.e., over 400,000 acres across the Forest, and close to 50,000 acres within the KRP planning area.

As with other species, the SNFPA (USDA 2001c) provided our analysis of Northern Goshawks with useful historical and habitat information. Evidence suggests the low number of goshawk breeding territories (ranging from 12 reported in the SNFPA (USDA 2001c) to the 20 such territories known to exist today) has remained relatively stable since some of the earliest data were reported by Grinnell and Miller (1944 – as cited in USDA (2001c)), because there has been no apparent change in the geographic distribution of Northern Goshawks in the Sierra Nevada since then. Thus, goshawk numbers in the Sierra NF remain fairly low. Reasons for this, as put forth by the SNFPA (USDA 2001c), include (1) vegetation management practices, (2) the fact that the Sierra NF is near the southernmost edge of the goshawk's range, and (3) survey efforts for goshawks may be lower on the Sierra NF.

The major risk factors identified by the SNFPA (USDA 2001c) for goshawks are the effects of vegetation management and wildfires on the amount and distribution of quality habitat. Unfortunately, goshawk biologists are unsure of what constitutes "high quality" Northern Goshawk habitat in the Sierra Nevada, and as a result, historical patterns of land-use and its effects on goshawks are difficult to interpret. Brian Woodbridge (pers. comm., 8 Sept 2006), however, stated that the 4D CWHR size/density class, and perhaps also 5D, is used most frequently by nesting goshawks. Immediately after the implementation of the Proposed Action or the Reduce Harvest Tree Size alternative, the amount of suitable habitat would decrease by 924 acres or 875 acres, which is approximately two percent of the total suitable habitat (*ca*. 50,000 ac) within the KRP planning area and less than one percent of the suitable habitat on the Forest. In the long-term, this habitat is expected to recover within 10-20 years. This is important because the SNFPA (USDA 2001c) also reveals recent evidence suggesting there has been a reduction in good nesting and foraging habitat for goshawks within the Sierra Nevada. How these changes have affected the population, however, cannot be determined, due to a lack of reliable data on historic and current population sizes and distributions.

Because the alternatives put forth in this project will result in long-term increases in Northern Goshawk suitable habitat over time, along with the relatively stable geographic distribution and population levels of goshawks in the area, and the project's goal of increasing large diameter trees, the cumulative effects of vegetation management activities in the KRP initial eight management units taken together with past, present, and reasonably foreseeable activities on the Forest will not result in a loss of viability for the Northern Goshawk.

Cumulative Effects for Great Gray Owl

The area considered in determining the cumulative effects of past, present, and reasonably foreseeable activities on the Great Gray Owl encompasses the Sierra NF. This is an appropriate scale for cumulative effects for a species such as the Great Gray Owl, which is non-migratory and does not have a well-defined metapopulation structure (Duncan and Hayward 1994). Based on the following analysis, a determination of viability for the Great Gray Owl will be made.

Biological Evaluations for many of the past projects in the Sierra NF were reviewed to help inform the present analysis. Our review of these documents revealed the following basic information about effects to Great Gray Owls from these activities:

- Twenty-six (26) total project Biological Evaluations (BEs) were reviewed, dating back to 1993 on the Sierra NF.
- Determinations reached were:
    - No effect – 12 BEs
    - May affect individual owls, but not likely to lead to a trend toward federal listing or loss of viability – 10 BEs
    - May affect individual owls, and likely to lead to a trend toward federal listing or loss of viability – 0 BEs
    - Great Gray Owl was not addressed in the document we reviewed due to lack of habitat or other reasons – 4 BEs
- Types of Projects: Fuels reduction, harvest, hazard tree removal, and underburning were the proposed activities that were most often represented in the sample of BEs in which the Great Gray Owl was analyzed.
- Relative to "May Affect" projects, the described impacts to Great Gray Owls most often fell in the following categories:
    - Loss of foraging area if underburn gets out of control
    - Reduction of habitat quality
    - Temporary displacement because of smoke from underburning
    - Noise disturbance

Additional past, present, and reasonably foreseeable future activities are outlined at the beginning of Chapter 3 of the Kings River FEIS. Most of these activities were judged to have no effect on the Great Gray Owl due to the absence of suitable meadow habitat. Some of the cattle allotment and recreational activities, however, may affect the species. The two factors considered most important in determining habitat use by breeding Great Gray Owls are availability of nest sites and availability of suitable foraging habitat such as meadows (Duncan and Hayward 1994). Cattle allotments that alter the prey base in meadows may have an impact on this species.

Great Gray Owls in California prefer pine and fir forests adjacent to montane meadows (Winter 1986). It is likely that population densities and range expansion in California is limited by access to suitable hunting meadows, as Great Gray Owls seldom forage in forest habitat (Duncan and Hayward 1994). Currently, there are 9,015 acres of suitable Great Gray Owl habitat in the 4000 to 8,000 foot elevation range on the Sierra NF; 585 acres of that total are within the KRP planning area. The cumulative effects to the Great Gray Owl will be more limited in scope compared to some of the other species because the areas that are suspected to have owls (i.e., areas near or within meadows) have traditionally not been targeted for silvicultural treatments. These same conditions would apply under both action alternatives. Across the forest, meadows and usually 50 to 100 feet around them have not had treatments of any kind, not even burning over the last 30

years. The action alternatives do not propose any treatments within the 100 feet buffer zone around a meadow.

The total California population of Great Gray Owls was estimated to be 60 individuals by Winter (1985). At the time of his survey in 1984, Winter reported no new evidence of Great Gray Owls on the Sierra NF. In fact, only Black Point in Fresno County and Jackass Meadow in Madera County had recent owl evidence (two heard in 1979, and one possible sighting in 1980, respectively). Winter concluded that the Yosemite area was the owl's last stronghold in California. Rodney Siegel (2001, 2002) reported evidence (i.e., pellets or visual sightings of individuals) of Great Gray Owls at seven Sierra NF sites, ranging in elevation from 4000 – 7000 feet, in 2001 and 2002. An additional seven Sierra NF sites bore no evidence of Great Gray Owls during that time. Additionally, no nests were found during the 2001 and 2002 survey seasons. Most recently, just one management site within the project area (KRW PRV 1) had evidence of Great Gray Owls in 2004.

Given the amount suitable habitat within the project area and across the Forest, along with the fact that Siegel (2001, 2002) found evidence of Great Gray Owls at one-half of Sierra NF sites that were surveyed, and the project's goal of increasing large diameter trees while protecting meadow and riparian habitats, the cumulative effects of vegetation management activities in the KRP initial eight management units taken together with past, present, and reasonably foreseeable activities on the Forest will not result in a loss of viability for the Great Gray Owl.

Fisher, FSS and MIS

General Information

Fishers have been studied and monitored within the KRP since the mid-1990's (Boroski and others 2002; Mazzoni 2002; Zielinski and others 1997, 2005; Rick Truex, USFS, pers. comm. 2006; Mark Jordan, University of California, pers. comm. 2006). In addition to Forest Service inventory and monitoring work and Mark Jordan's studies of fisher population density, Amie Mazzoni conducted her master's thesis research in this area, radio-tracking fishers and determining the habitat characteristics of their resting sites (Mazzoni 2002). Although Mazzoni (2002) documented many rest sites throughout the KRP area, to date no den sites have been identified in the KRP.

Based on extensive track plate and camera surveys (1997-present) in the Region 5 Status and Trend Monitoring Program and the systematic surveys coordinated by Bill Zielinski from 1996-2002, the following observations can be made about the population (Rick Truex, USFS, pers. comm. 2006):

- Fisher currently appears to be limited in distribution from approximately the southern extent of the Sierra Nevada in Kern County (Greenhorn Mountains and Kern Plateau) to Yosemite National Park.

- Fishers appear to be absent from the Stanislaus NF, and the northern extent of the population in Yosemite National Park is not well defined. It appears fishers do not occur north of State Highway 120 in Yosemite NP.
- Within the southern Sierra population, fishers occur on the west slope of Sierra and Sequoia NF as well as on the Kern Plateau portion of Sequoia NF (and southernmost Inyo NF).
- Patterns of detection within the southern Sierra Nevada fisher population suggest the following:
    - Fisher are well distributed on the west-slope Sequoia NF, from the Kings River south through the Greenhorn Mountains. Annual rates of occupancy (i.e., proportion of sites sampled that detected fisher) are generally consistent, and the spatial distribution of detections is more consistent from year to year than elsewhere in the southern Sierra. This area has been consistently occupied since surveys began in earnest during the early 1990s.
    - Recently the detection rate of fisher on the Sierra NF is roughly half what it is on the Sequoia NF. Fisher may have increased their spatial distribution on Sierra NF since the mid-1990s. The annual occupancy rate within Sierra NF seems to be consistent, though the spatial pattern of detections appears more variable among years than on the Sequoia NF. Mark-recapture data collected over the last several years estimate the density of fisher in the KRP area at approximately 1 per 2,500 acres (Mark Jordan, University of California, pers. comm. 2006).
    - Fisher still occur on the Kern Plateau following the McNally fire of 2002. The long-term effects of the McNally fire on the fisher population are unknown. Surveys conducted by Region 5 and Sequoia NF suggest fishers are absent or reduced in distribution in the southern portion of the Kern Plateau, but have been detected on northern portion of the plateau at several locations. Occasional detections in the southern half of the plateau have been observed.

A picture of how the habitat requirements are provided for in the design of the initial eight management units can be drawn from the following table:

Habitat requirements provided for in the design of the initial eight management units.

Habitat/Life History Element	Applicable KRP Expectation
Multi-storied and multi-species coniferous forest are preferred by fisher	Uneven-aged silvicultural system provides multi-storied stands and seeks to restore historic multi-species tree composition.
Natal dens of fisher are in live and dead white fir and live black oak with average dbh of 22". Resting habitat can be favored by retention of large trees and recruitment of these trees	Uneven-aged silvicultural system retains trees > 30" or 35" dbh, depending on the alternative. The purpose and need recognizes the need to increase the number of large trees.
The average female fisher home range is 2944 acres.	Management units are designed to be one-third the size of a female fisher home range. Treatments of the units are dispersed in time and space to limit effects to any given home range.
Fisher prefer to spend most of their time within 100 feet of water courses.	OFLs are focused on perennial stream courses.
Fisher prefer conifer cover > 20 %	All forested areas, except reforestation groups, will have conifer cover > 20 %

Evaluative Criteria

Informed by the discussion in this section, key criteria have been identified that will be used to clearly display and quantify the effects to the fisher and its habitat. Following is a summary of effects for these analysis criteria:

- **Canopy cover across the landscape**
  - Under Alternative 1, the long term goal is to develop or maintain 50% of the landscape (excluding rock and thin soils) in CWHR class 4 or higher with 50% canopy cover or greater. Even though there is a decrease in canopy cover from implementation of Alternative 1, the fisher goal is achieved in 10 years after treatment.
  - Under Alternative 3, the long term goal is to develop or maintain 50% of the landscape outside of WUI with canopy density >60% within female fisher home ranges, or where these ranges are unknown, within HUC 6 watersheds. Of the three HUC 6 watersheds used in the analysis, two remain unchanged and within one, (the Lower Dinkey Creek Watershed) the number of acres meeting the goal are reduced by 1%.

- **Protection of potential den sites and denning fishers**
  - An LOP will be implemented if den sites or denning fisher are found under either action alternative. Under Alternative 3, prescribed burning will be implemented outside the denning season, where practicable.
  - Natal dens of fisher are in live and dead white fir and live black oak with average dbh of 22". Resting habitat can be favored by retention of large trees and recruitment of these trees. The uneven-aged silvicultural

strategy retains trees > 30" or 35" dbh, depending on the alternative. The purpose and need recognizes the need to increase the number of large trees.

- **Protection of stand-level habitat components and individual rest structures important to fisher (e.g., large diameter snags and oaks, patches of dense large trees, and coarse woody debris)**
  - Protect important habitat structures such as large diameter snags and oaks, patches of dense large trees (typically ¼ to 2 acres), large trees with cavities for nesting, and coarse woody material; use firing patterns and place fire lines around snags and large logs to minimize effects of underburning. The "Fisher and Priority Sites Marking Guide – Kings River Project" will be used to identify the most suitable individual trees and groups of trees for retention under Alternative 3.
  - Multi-storied and multi-species coniferous forest are preferred by fisher. The uneven-aged silvicultural strategy provides multi-storied stands and seeks to restore historic multi-species tree composition.

- **Establishment of a system of travel corridors or "old forest linkages" (OFLs)**
  - A system of old forest linkages have been created along perennial steams and include 300' of adjacent habitat with 60% canopy cover on each side of the streams.
  - Fisher prefer to spend most of their time within 100 feet of water courses. OFLs are focused on perennial stream courses.

- **Adaptive management and response mechanisms**
  - The response of fishers to changes resulting from treatments would be studied through densification and modification of the existing Region's Status and Change monitoring program to provide information on habitat use before and after treatment and in control areas

- **Resting site probability model (the probability of an area to be used by fisher over time)**
  - An analysis has been conducted to determine the probability of fisher using the area overtime and it shows they do return to the area when activities have occurred.

- **Effects of stand-replacement fire**
  - By implementing Alt 1 it will reduce the effects of stand-replacement fire with some large trees. If Alt 3 is implemented it will be the same outcome with a few larger trees not removed in treatment.
  - Stand replacing fire is a constant threat to fishers and their habitat. Model results indicate that following a fire that encompasses all eight management units, the number of suitable acres present will be 2862 for the No Action Alternative, 7160 for Alternative 1, and 7291 for Alternative 3. Suitable habitat is also predicted to develop more quickly post-fire under Alternatives 1 and 3.

Direct and Indirect Effects for Fisher – All Alternatives

The availability of suitable resting/denning habitat is considered to be more limiting to fisher populations than the availability of foraging habitats (USDA Forest Service 2006). We used data presented by Freel (1992) to help inform the definitions of resting/denning versus foraging habitat (Table 3-31). Also, we validated these habitat definitions by comparing them to CWHR Version 8.1 (California Department of Fish and Game 2005) and discussing them with fisher research scientists (Dr. W. J. Zielinski, Dr. K. Purcell, and R. Truex, pers. comm., 21 Sept 2006). This discussion resulted in the identification of an alternative method for describing fisher reproductive habitat.

In general, we found Freel's (1992) definition for resting and denning habitat matched the CWHR's definition of reproductive habitat. However, we noted that CWHR's definition of foraging habitat included several "S" and "P" densities that were not used by Freel. Interestingly, the discussions with research scientists, particularly Dr. Zielinski, indicated recent field work shows fisher are using most CWHR types for foraging. Nonetheless, we retained the somewhat more restrictive Freel model for the sake of consistency of approach and did not include the S and P densities as foraging habitat. We do not believe this appreciably changes the habitat picture, since foraging habitat is clearly not limiting to fisher. The fisher scientists believe that reproductive habitat is limiting to fisher.

CWHR version 8.1 was used as a basis to define what we consider to be a minimum habitat map, based solely upon forest types, ages, and canopy densities listed therein as HIGH quality reproductive habitat. We further restricted the forest types considered to provide reproductive habitat from those listed in CWHR, based upon personal communication with Dr. Bill Zielinski (21 Sept 2006). This resulted in the elimination of the following types: aspen, eastside pine, lodgepole pine, red fir, and subalpine conifer. This generated a more restrictive map of high quality reproductive habitat.

For purposes of this analysis and to ensure the full scope of effects is adequately portrayed, we present hereinafter fisher suitable habitat totals based on definitions (Table 3-31) provided by:

- Freel (1992); and
- CWHR Version 8.1 (California Department of Fish and Game 2005), as informed by the latest findings by fisher research scientists (hereafter **CWHR 8.1 Modified**)

Fisher Habitat Use Category	*Habitat Definitions for the Habitat Classification Systems Used in the Analysis*	
	Freel (1992)	**CHWR Version 8.1 + Current Research (CWHR 8.1 Modified)**
Denning/Resting	Jeffrey Pine, Lodgepole Pine, Montane Hardwood Conifer, Montane Hardwood, Montane Riparian, Ponderosa Pine, Sierran Mixed Conifer, Red Fir and White Fir 4M, 4D, 5D, 5M	Jeffrey Pine 4D, 5D Montane Hardwood Conifer 4D, 5D, 6 Montane Riparian 4D, 5D, 6 Ponderosa Pine 4D, 5D Sierran Mixed Conifer 4D, 5D, 6 White Fir 4D, 5D, 6
Foraging	3M, 3D, 4M, 4D, 5M, 5D	N/A – definitions not included due to the generalist use of habitats by foraging fishers

Table 3-31. Fisher habitat use category definitions for denning/resting and foraging habitats.

Using Freel, the eight units currently have 9050 acres of suitable habitat. Extrapolating from Jordan (2006), this area of suitable habitat could support approximately four fishers. However, because the management units are dispersed across the 131,500-acre KRP planning area, it is likely that these eight management units include portions of the home ranges of a larger number of fishers.

Of the three habitat elements (individual rest structures, stand-level habitat characteristics and landscape-level habitat composition) highlighted by Mazzoni (2002), the proposed action focuses on two, the need to increase the number of large trees and the adaptation in the KRP of the uneven-age silvicultural system to create and/or maintain multi-storied and multi-species stands. In addition, a major focus is to reduce the threat of severe wildfire. These improvements or benefits to fisher habitat come at the expense of a reduction in canopy cover in the initial eight management units but it is almost entirely in 11 to 24 inch trees (CWHR Class 4). This reduction is ameliorated by the creation of old forest linkages, as described in the proposed action, that are focused on perennial streams where fisher prefer to spend most of their time and by the canopy cover available at the landscape level.

The protection measures (see summary in F&WS technical advice - Appendix D, page 4) proposed for the fisher will provide some protection from harm and promote the recovery and development of suitable fisher habitat. Measure #1 states that the long-term project goal is to maintain >50% of the landscape in CWHR type 4 or greater with at least 50% canopy cover, or to maintain 50% of lands outside of WUI with canopy density >60%. This goal should ensure the maintenance and recovery of fisher foraging and dispersal habitat, however, because rest and den sites in the Sierra Nevada average >70% to > 90% canopy cover its effect on these uses cannot be evaluated. Measure #2 will reduce the likelihood that denning fishers will be harassed or harmed by prescribed burning. Measure #3 establishes a commitment to protect resting and denning-type structures and associated density in areas outside of WUI. Measure #4 protects large trees of the size typically used for resting and denning throughout the project area, but does not address the requirement for canopy density. Measure #5 refers to the system of OFL that will be

maintained along streams to enhance habitat connectivity. Finally, measure #6 requires monitoring fishers in treatment and control units.

Fishers may be directly harmed by the removal of potential rest or den trees. The risk to fisher depends on the proportion of resting-size trees that will be harvested within any individual fisher's home range. The risk to fishers is mainly from harvesting conifers 12-34 in dbh. The probability of directly harming or killing a fisher during harvest is low. This is due to the number of resting size class trees remaining, low fisher densities in the area, and because fisher home ranges are generally larger than management units.

Alternative 1 and Alternative 3 limit removals to 35 inches and 30 inches respectively, with the exception of hazard trees. Over the last five years approximately 4400 hazard trees were removed across the 130,000 acres of the KRP area. This would indicate that one hazard tree for every 29 acres of the project area may exist. This would equal approximately 500 trees across the initial eight management units. Hazard tree removal may eliminate some potential fisher rest sites. Uneven-aged tree removals and thinning from below in Alternative 1 would remove approximately 12% of trees 30" to 35" dbh. Both action alternatives would remove an additional 12% of trees 20" to 30" and approximately 20% of trees 10" to 20" dbh. While these removals reduce the number of potential rest trees, the majority of potential rest trees will remain. This in combination with other protection measures will limit the effects on fisher.

Smoke and fire from prescribed burns on 4685 acres could also harm, harass, or kill fishers in the area. Because prescribed fire should not consume resting-size class trees, and snags and large logs will be protected during prescribed burning through the use of firing patterns and placement of fire lines to minimize effects on these resources, the direct effects of prescribed burning on fishers is generally expected to be small. Also, by conducting burning outside the fisher denning period of mid-March to mid-May, to the extent practicable, the potential effects will be minimized.

The eight management units currently contain 2779 acres of CWHR 8.1 Modified types 4D and 5D, which will be reduced to 1834 acres (Alternative 1) or 1917 acres (Alternative 3) after treatment. Because the available research indicates that fishers preferentially select forested habitats with >70% canopy density and multi-storied canopies, the effect of reducing the area of CWHR type 4D and 5D forest by 34% or 31 %, depending on the alternative, while maintaining ¼ to 2 acre pockets of suitable high density habitat, cannot be predicted with certainty. In these eight management units 6830 acres are in WUI and DFPZ, and 557 of these acres (5%) will be changed to habitat types unsuitable for use by fishers (i.e., not 5D, 4D, 5M, 4M, or 3D).

Over the 30 years following the initial treatments, habitat will recover and the acres of CWHR 8.1 Modified type 4D and 5D habitats are predicted to increase. Whereas there are currently only 69 acres of CWHR type 5D habitat, 30 years after treatment 363 (Alternative 1) or 383 (Alternative 3) acres of 5D are predicted. Similarly, CWHR type 4D currently totals 2710 acres, but 30 years after treatment 3686 (Alternative 1) or 3684 (Alternative 3) acres of 4D are projected. However, the models predict that CWHR type 4D acreage will be at or below current levels for more than 20 years after treatment.

Many of the activities proposed for the KRP have the potential to harass or harm fishers, causing animals occupying treated areas to move away from the project areas and avoid

them for an undeterminable period of time, or at a minimum altering their normal patterns of movement and foraging. Mechanical treatment of 9751 acres within the eight units will substantially modify the vegetation and disturb the majority of habitat suitable for and likely occupied by fishers. Vegetation removal, noise and the physical presence of machinery and personnel for harvesting and fuels treatment operations are likely to harass fishers. Fishers may also leave areas of prescribed burning in response to smoke and fire. The ultimate effect on fishers of disturbance and potentially forced migration is unknown, but is unlikely to be wholly beneficial. Because management units are designed to be smaller than most fisher home ranges, it is conceivable that displaced individuals will shift their activities to portions of their home range outside of the disturbed areas; however, some may be displaced into unfamiliar territory. Fishers stimulated to migrate by project activities may have to move through or arrive in less suitable habitat where risk of mortality due to predation or physiological stress will likely be higher. Some fishers may remain in treated management units or return soon after treatment. These individuals are likely to be harmed by reduced habitat suitability and reduced availability of their small vertebrate prey base.

Disturbance may also increase the density of fishers in untreated areas. The temporal extent of these effects cannot be predicted with confidence, but model projections of habitat development suggest that effects will persist for between 10 and 20 years. Because the KRP area is bounded by the San Joaquin and Kings Rivers, which are thought to restrict dispersal, increased density in undisturbed habitat is expected. Assuming that during treatments fishers move from the eight units (9760 acres) to untreated suitable habitat in the KRP (38,400 acres), the density of fishers in these areas will be increased by approximately 41% overall. To acquire adequate resources, fishers may have to shift or expand their home ranges, encompassing larger areas of marginal quality habitat. Resource availability (e.g., prey) in adjacent untreated areas will likely decline due to the increased density of animals. Fishers expanding their home ranges into unfamiliar areas are likely to be more vulnerable to mortality from predators, physiological stress, or starvation. Because researchers have found dead fishers apparently killed by other fishers (Truex *and others* 1998), fishers displaced from treated areas into other fishers' home ranges also may be vulnerable to intraspecific predation. Although this temporary disturbance will affect most of the suitable fisher habitat to some degree, the area that will be converted to habitat unsuitable for fishers is estimated to be approximately 10% of what currently exists.

The table below shows the suitable acres immediately after thinning that are in the Old Forest Linkage (OFL) in and outside of the Protected Activity Center (PAC) and Defense and Threat Zones. It also shows the non OFL suitable acres that are in and outside of the PAC and Defense and Threat Zones. The final columns show how the habitat changes inside and outside the PACs but nothing changes in the OFL.

Table 3-32 - Summary of Plant Aggregation Level Analysis of Suitable Fisher Habitat Acres in the Initial Eight Mgt. Units immediately after Thinning using Freel (1992).

	OFL Suitable			NON OFL Suitable			Changed to NON-suitable habitat (4P or 5P)			
	PAC	NON PAC	OFL subtotal	PAC	NON PAC	Total Before Thinning	OFL	NON OFL inside and outside PACS	PAC	Total
WUI-Defense	32	189	221	617	1915	2753	0	296	5	296
WUI-Threat	54	366	420	791	2930	4141	0	243	-4	243
NON WUI	57	137	194	805	1980	2979	0	384	41	384
Sub Total	143	692	835	2213	6825	9873	0	924	46	924

Effects of Stand Replacing Fire: Each alternative incorporates the concept of wildfire entering one or a couple of the initial eight management units ten years after the record of decision. Fire records for the KRP indicate it is likely one or a couple of the management units could be significantly affected by a stand replacing fire on a hot windy summer day but it is unlikely numerous management units or an entire watershed would be affected at one time. The charts below assume that the wildfire would likely burn one or a couple of management units on a hot windy summer day. There would be a greater loss of habitat if no treatments occur because the trees are denser and there is a higher likelihood of habitat being burned severely. Stand replacing fire is a constant threat to fishers and their habitat. Model results indicate that following a fire that encompasses all eight management units, the number of suitable acres present will be 2862 for the No Action Alternative, 7160 for Alternative 1, and 7291 for Alternative 3. The best scenario among the alternatives is to implement the reduction of harvest tree size alternative because it reduces the effects of fire and after 30 years there would be approximately 9900 acres, if no wildfire occurs. Under this same alternative, approximately 8200 acres of suitable habitat would be available after 30 years, if wildfire occurs.

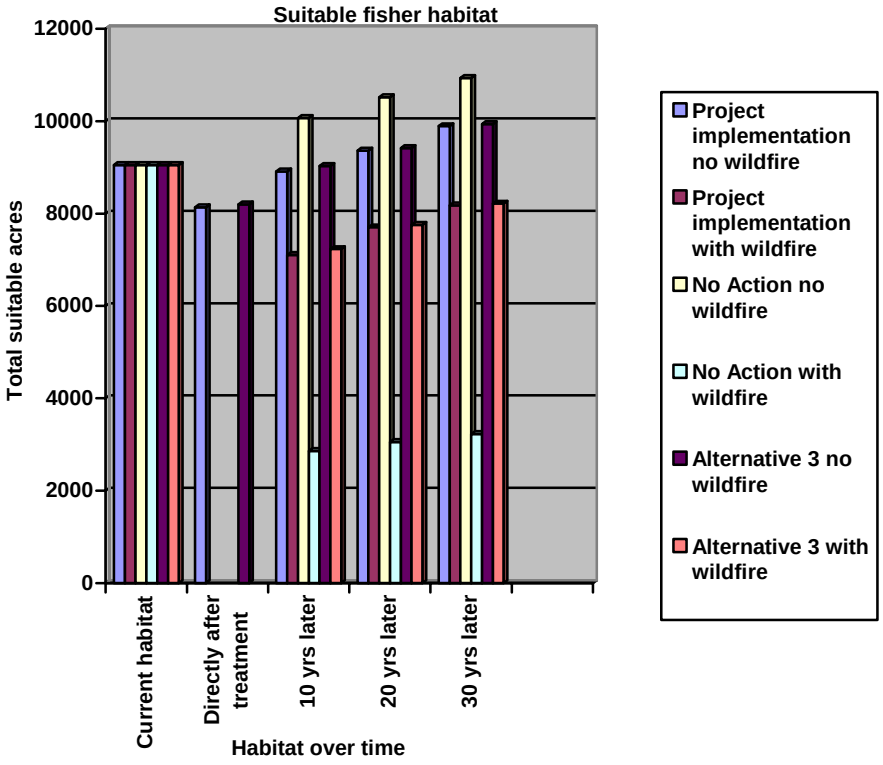


Figure 3-52 - Habitat effects of implementing the alternatives, with and without wildfire, using Freel.

The Forest Vegetation Simulator- Fire Fuels Extension was used to simulate potential fire intensity, tree mortality and fuel consumption. Figure 3-52 gives information detailing the potential impact of a simulated fire on forest structure and identifies which alternative responds best to fire.

If alternative 1 or 3 is implemented, it will move the fisher habitat closer to high suitable habitat and reduce habitat fragmentation due to wildfire. It is important to note under alternative 1 and 3 the mechanical treatment is important for the plantations because it helps move them toward foraging and eventually denning habitat over time. There may be a short term negative effect to the species; however, there will be a long term beneficial effect because the habitat elements are provided, as outlined in the preceding chart, and canopy cover will increase over time. If Alternative 1 or 3 is implemented and a wildfire occurs, then there will be a loss of habitat but it will not be as great as would occur with the No Action Alternative. Lower tree density and subsequent fuel treatments reduces the effects of wildfire. Both Alternatives 1 and 3 emphasize the retention of large trees which are more fire resistant.

The effects of fire (underburning) on fisher resting sites have shown a short term reduction on estimated fisher resting habitat suitability as described by Truex and Zielinski (2005). It appears that if care is taken to apply treatments with the goal of protecting large hardwoods and conifers the potential reduction in habitat quality may be mitigated. Therefore, under alternative 1 and 3 there may be a direct effect to fisher which utilizes the area. The smoke from burning may deter them for a short time but they most likely would return to the area. When trees are being removed with mechanical

equipment (e.g. tractor, masticator) there may be a direct effect due to the noise disturbance involved with project activities. Underburning and vegetation manipulation have occurred in previous years where we have fisher detections. Moreover, district records show fisher being detected in areas that have previously received underburning or vegetation treatments. These detections support the idea that fisher would return to the project area once the proposed activities are completed.

Modeling Fire Effects on Fisher Habitat

As described in Appendix H, computer models were used to display the current condition, direct effects (post treatment), indirect (future) effects and cumulative effects (landscape and future) from the proposed action. A detailed description of modeling methods is contained Appendix H.

Resting Site Probability Model: Dr. Zielinski (PSW scientist) and Dr. Krucera (UC Berkeley scientist) were consulted by the KRP ID team to assist with the modeling of fisher rest site probability. Dr. Zielinski developed three equations (models) that predict probability of fisher rest site use (Zielinski and others 2004) for California. Two of these were used to model the change in fisher rest site probability (Sierra and Female models). Further consultation determined that the Fisher model (Zielinski and others 2004) was not appropriate for the KRP because it was intended for use at a larger bioregional scale (pers comm Zielinski and Krucera 2005).

Zielinski's Female and Sierra models were used to simulate changes to fisher rest habitat selection by various treatments contained in the alternatives (Appendix H). Parameters used in the two models follow:

1. Sierra model – largest dbh tree; standard deviation of the mean dbh; percent slope; presence of water within 100 meters
2. Female model – canopy density; dbh of largest tree; percent slope; presence of large conifer snag

Six scenarios were used to simulate the effects of alternatives using the two models above: 1) Proposed action/no wildfire; 2) No action/no wildfire; 3) Proposed action/wildfire; 4) No action/wildfire; 5) Reduction of harvest tree size/no wildfire and 6) Reduction of harvest tree size/wildfire.

More recent research on the use of forest inventory data to simulate the effects of forest management treatments on fisher resting habitat suitability in California has been published (Zielinski and others 2006). This newer research developed similar but more generic modeling algorithms to predict fisher rest site habitat use. The new models were developed to ease the use of Forest Inventory Analysis (FIA) data to predict and monitor rest site use. Additional consultation with Dr. Zielinski determined that to reanalyze fisher rest site use with the FIA model would not produce significantly different results (pers.comm email 2006).

Model Output versus Actual Rest Site Data: Known fisher rest site locations (Jordan and others (2005) and Mazzoni (2002)) were compared to predicted rest site locations. Jordan and others (2005) and Mazzoni (2002) trapped and or photographed fishers across the KRP area and the Sierra National Forest. This detection data was overlaid with the modeling results from Zielinski's rest site probability equations. The comparison

examined the plot locations with greater than ten percent probability to known rest sites. Where known rest site locations came with in 300 feet of plot data, the highest probability plots coincided with known sites.

The majority of the areas described by the model as non-suitable resting habitat did not have fishers located in the area. A correlation exists between the predicted model and where fisher data was collected with a confirmed animal, either by camera stations or photographs.

Research on fisher habitat rest site use emphasized the maintenance of canopy density, large trees, and habitat features near water. These forest attributes were used to create OFL (Appendix C). As discussed above, work by Jordan and others (2005) and Mazzoni (2002) was overlaid with the modeling rest site characteristics information; it was shown that the fishers were located in resting areas that the model predicted were resting sites. OFLs coincide with rest site use data collect by Jordan and others (2005) and Mazzoni (2002). In addition, it showed that 30% percent (245/796) of the resting areas in Jordan's work are in OFL while 51% (26/51) of the resting areas in Mazzoni's work are in OFL. This would infer that OFL design measure encompasses a large proportion of resting potential.

Results of the Resting Site Probability Modeling: The Sierra model shows a higher fisher rest site probability for Alternative 1 and Alternative 3 than Alternative 2 (No Action) after treatments. After wildfire, rest site use probability remains higher under Alternative 1 and Alternative 3. This would indicate that more fisher rest sites are protected in the treated landscape. The increase in probability for the action alternatives results from the increased diameter growth and maintaining variable stand structures. The structures under the no action alternative tend to become less variable over time as the density will kill suppressed and intermediates and diameter growth will be slower than in the action alternatives. The bottom line is there is minimal effect to the rest sites overall from Alternative 1 or Alternative 3 than Alternative 2 (No Action). See the terrestrial BE for the associated figures that show the summary above.

The Female model shows a loss of rest site probability after treatments. After severe fire, Alternative 1 and Alternative 3 maintain more fisher rest sites and have a higher probability for use than Alternative 2 (No Action). Within OFL, simulation results of the Female model indicate that all alternatives experience a similar high loss of fisher rest site habitat. Alternative 1 or Alternative 3 within the OFL maintains multi-storied canopies and high tree canopy density because minimal manipulation occurs in the drainages. Multi-storied stand conditions result in ladder fuels that often predispose fisher rest sites to torching and crown fire.

Provisions Made in the Design and Scheduling of Management Units for Fisher

As stated on page 41 of the Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement ROD, the Forest has been designated as part of the Southern Sierra fisher conservation area (SSFCA) because of the known occupied range of the Pacific fisher in the Sierra Nevada. The SSFCA is approximately 720,606 acres on the Forest. There are fisher sightings within some of the management units. Den sites exist but their locations are unknown. The following measures are designed to protect and maintain fisher habitat.

Old Forest Linkage (OFL): Within the KRP boundaries is an area where there is the largest concentration of private land within the boundaries of the Sierra National Forest. The Forest Service cannot rely on private land to be managed in a way that is favorable for the fisher and other species associated with old forests. Thus, the National Forest land base could prove important for the maintenance of habitat linkages for old forest species. The designation of the old forest linkage (OFL) within the KRP area was undertaken as described below.

Vegetation data, owl locations and stand boundaries were examined as the first step to identify the OFL areas within KRP. The objective was to identify areas that should be managed to maintain connectivity of old forest habitat areas within the KRP area as well as the rest of the Sierra NF to the north, east, and south. There are 4609 acres of OFL in the entire Kings River Project area. Of that there are 1085 acres of OFL within the initial eight management units. Some of the OFL follow roughly the same path as those identified in the LRMP. The majority of these OFL are within the Southern Sierra Conservation Area (SSFCA). The OFL outside the SSFCA are intended to maintain habitat connectivity for marten and spotted owls.

Several habitat linkages are needed to ensure habitat connectivity in the event that a linkage is lost to a stand replacing event, such as wildfire. Habitat on private land was not considered as a contribution to the OFL, for the reasons stated above. Therefore, OFL were only designated on Forest Service land around blocks of private land. Key habitats for fisher are structurally complex late successional coniferous forests. Habitat connections would be maintained by areas greater than forty percent crown canopy cover, interconnected via riparian areas (OFL). There are two major OFL extending north to south along Big Creek and Dinkey Creek. They are linked together from east to west at the northern and southern portions of the KRP area. There are a number of creeks that were designated OFL. The supporting rationale for designation of OFL is described in Appendix C. The creeks described are Big Creek and Dinkey Creek; Nutmeg Creek; Bear Meadow Creek, and Oak Flat Creek; Summit Creek and Grand Bluff Bald Mountain and Rock Creek; Cow Creek; Bear Creek and Deer Creek; East Deer Creek and House Meadow Creek; Bull Creek; Turtle Creek and Ross Creek (Appendix C).

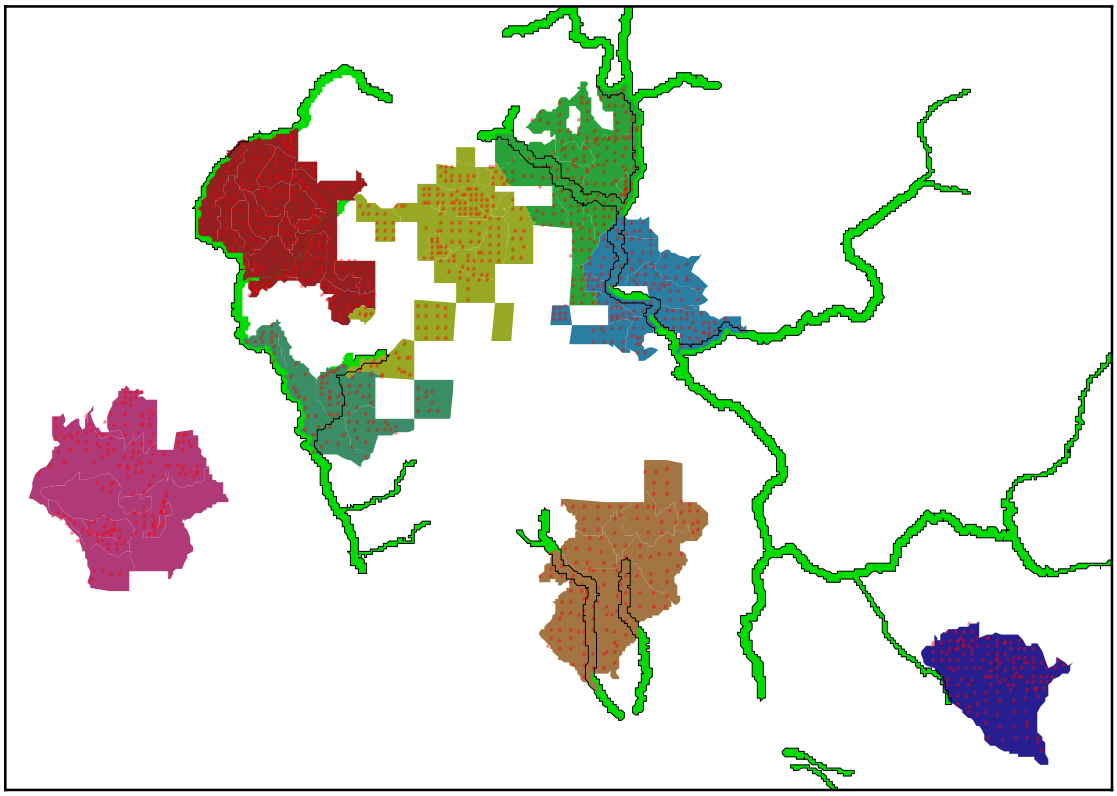


Figure 3-53 - The initial eight management units outlined with the fisher corridor buffers. Dots represent plot locations used in the fisher resting habitat suitability model.

Recruitment of Large Trees: The purpose and need recognizes the need to increase the number of large trees. Alternative 1 limits tree removals to trees less than 35 inches. Alternative 3 limits tree removals to tree less than 30 inches. These design measures protect large, older trees that are found less frequently on the landscape. Treatments that remove fuel ladders (small trees) under the uneven-aged silvicultural strategy and the thinning from below are designed to protect large trees (> 35 inches) and the recruitment of medium sized trees (20-35 inches). Tree removals of medium sized trees provide additional growing space that allows these trees to grow larger faster. It is these medium sized trees that provide the necessary recruitment of future large trees (see Vegetation Section).

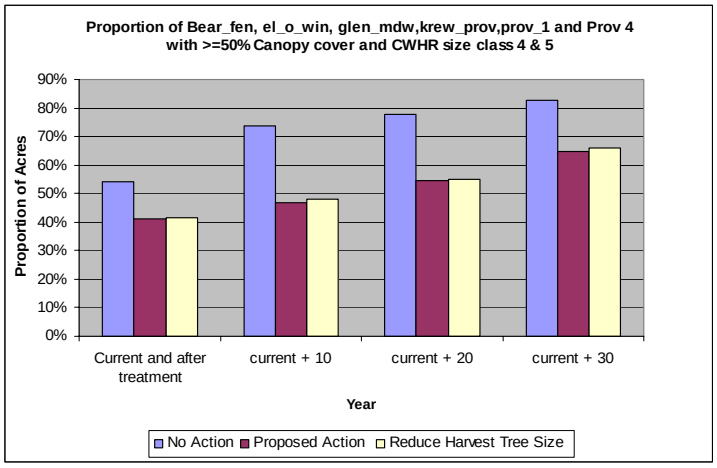
Fisher Rest Site Retention Guide: A fisher rest site retention guide protects key fisher habitat attributes (large trees, dense canopy, proximity to water, and percent slope). As the marking crew delineates the trees to be removed they will also assess the trees to see if they meet the criteria for fisher rest sites. If they do meet the criteria the associated area and tree will not be marked for removal. Each stand will have rest sites identified on the stand record card and GPS location recorded for future reference. This guide can be found in Appendix D. The guide was designed with the fuels officer, silviculturalist and wildlife biologist.

Indirect Effects from Change in Canopy Cover on Fisher Habitat

Both thinning from below up to a maximum diameter of 20 inches in the California Spotted Owl Study (CSOS) and up to a maximum diameter of 30 or 35 inches, depending

on the alternative, in the KRP uneven-aged management strategy are proposed to increase growing space and reduce fuel ladders. Reductions in canopy cover result from this process of removing trees. Following thinning, canopy cover declines then recovers over the next thirty years due to growth.

The most appropriated representation of the effect on the fisher goals of the action alternatives is to ignore krew_bull_1, a high elevation habitat, and n_soapro_2, low elevation habitat. Although higher elevation habitats (i.e., red fir forests) may provide ample structures for denning and resting, deep snow during the winter months likely impedes fisher mobility (Krohn and others 1995); as a result, these forests are of less value to fisher than mid-elevation habitats where snow cover is sporadic and rarely deep for extended periods. Lower elevation habitats in the southern Sierra Nevada (chaparral and woodlands) lack resting and denning structures, and may not provide thermal regulation during hot summer months (Lamberson 2000).



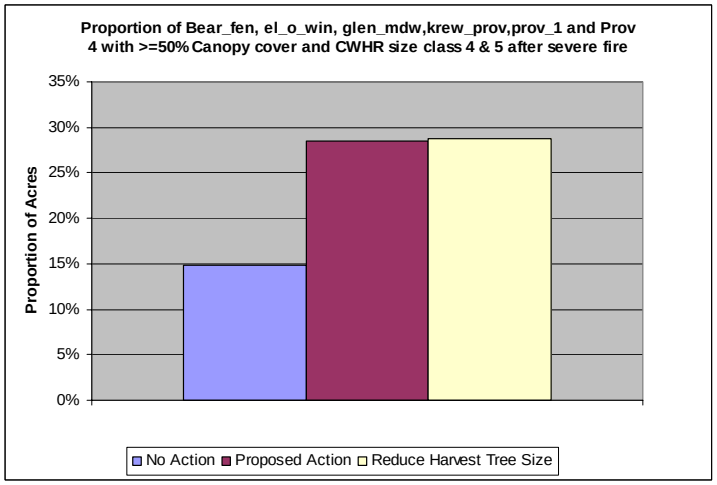


Figure 3-54a - Displays the proportion of the six initial management units that most appropriately represent the effect on the fisher goals of the action alternatives, throughout the analysis period. Figure 3-54b - Displays the effect of severe fire on canopy cover.

Figure 3-54a displays that across the six initial management units that most appropriately represent the effect on the fisher goal of the action alternatives, the proportion of 50 percent or more canopy cover and CWHR size class 4 and 5 drops due to treatments to

just over 40 percent then increases to approximately 52 percent. This increase in acres of canopy cover is the result of tree crowns expanding to occupy growing space. The canopy cover must drop somewhat to accomplish the needs of increasing the number of large trees and reducing effects from wildfire and insect attack.

Even with the initial decrease in acreage from 43% to 40% that meets the fisher goal in canopy cover from the action alternatives, the fisher goal for the proposed action is achieved across the 72,000 acres of forested KRP landscape within 10 years. Since the initial eight management units are dispersed across the KRP area, the indirect effects of the initial eight management units are dispersed across the landscape.

The desired condition outlined by the 2004 SNFPA is to maintain high quality fisher habitat in known female fisher home ranges outside the WUI with tree canopy cover greater than 60% over 50% of a female home range. If female fisher home ranges are not known, HUC 6 watersheds are to be used in the analysis. Because female fisher home ranges are largely unknown for the analysis area, HUC 6 watersheds were analyzed. The management intent is to retain suitable habitat to the extent possible, recognizing that treated areas may be modified to meet fuels objectives (2004 SNFPA). The analysis displayed in Figure 3-22 (Vegetation Section of Chapter 3) indicates that for the HUC 6 watersheds, canopy cover greater than 60% is reduced in the lower Dinkey Creek watershed by approximately 1%. Within the Big Creek watershed reductions also occur but this watershed area is below the elevational range of the fisher (3500 feet) and contains the n_soapro_2 management unit. Reductions in canopy cover occur as a result of mechanical treatments in both action alternatives. These same treatments increase the resistance of home ranges to wildfire. Alternatives 1 and 3 maintain similar amounts of the dense tree canopy acres.

Summary of Direct and Indirect Effects:

Fishers have been studied and monitored within the KRP since the mid-1990's (Boroski and others 2002; Mazzoni 2002; Zielinski and others 1997, 2005; Rick Truex, USFS, pers. comm. 2006; Mark Jordan, University of California, pers. comm.2006). These studies were used to assess population stability, mortality, and effects of the uneven-aged management strategy.

Population is stable: Using camera traps, the density of fishers in the study area was estimated to be 13 fishers per 100 km^2 in 2002 (unpubl. data) and 10 fishers per 100 km^2 in 2003 and 2004 (Jordan *et al.* 2005). Jordan's study area was larger than the two watersheds described for the KRP. The abundance estimates for this time period were 47, 42, and 44 individuals from 2002 through 2004 respectively.

Based on this monitoring, it appears that fisher in the Sierra NF are well distributed but occur at lower densities than are observed farther south. (F&WS technical advice – Appendix D) Fisher detections were recorded at 20.3% and 17.3% of Sierra NF monitoring stations in 2002/2003 and 2004/2005, respectively (Rick Truex, USFS, pers. comm. 2006).

Recently the detection rate of fisher on the Sierra NF is roughly half what it is on the Sequoia NF. Fisher may have increased their spatial distribution on Sierra NF since the mid-1990s. The annual occupancy rate within Sierra NF seems to be consistent, though

the spatial pattern of detections appears more variable among years than on the Sequoia NF. Rick Truex, USFS, pers. comm.. 2006).

An estimated 28-36 individual fisher inhabits the KRP. It is thought the numbers are stable (Purcell 2006).

Mortality - Two individuals known to have died: We do not have data saying we have sink or source habitat because it takes reproductive and survival data to make these statements and we do not have that type of data at this time. We do not have estimates of survival until Mark Jordan completes the work. However, presently there is no indication mortality rates are abnormal because in the last decade only two fishers are known to have been killed. One was killed due to another fisher and the other one was recently hit by a Forest visitor's car.

Fecundity – Reproduction is occurring: From August 1999 through July 2000, a total of 17 different fishers (9 males, 8 females) were captured at 20 different sites. All of the captured fishers *"appeared to be healthy, to represent a variety of age classes, and to be reproductively active once mature"* and *"seven of the eight known females within the Project area produced kits in the spring of 2000"* (Boroski and Mazzoni 2000).

Uneven-age mgt. Strategy - Maintains and accentuates important fisher attributes: Truex and Zielinski (2005) anticipate the reduction of canopy closure associated with most vegetation management projects. They suggest that managers can plan actions that will maintain other habitat elements important to fisher (e.g. presence of large diameter hardwoods). Zielinski and others (2004) determined that trees larger than 40 inches are important for fisher rest sites. Mazonni (2002) indicates that mean female fisher rest site trees for are 39 inches dbh in the KRP. However, smaller rest site trees were found to be used in these studies. Alternative 1 and Alternative 3 protect trees larger than 30 and 35 inches, respectively. No hardwoods are planned for removal. Additionally, the Fisher Rest Site Retention Guide (Appendix D) will be used to identify the most suitable trees and groups of trees for retention.

Truex and Zielinski (2005) recommend, if conditions permit, early season burns appear to be preferable to late season burns in terms of the short-term impacts on fisher habitat. Whenever possible, early burns should be timed to proceed or follow the fisher denning period (mid-March through mid-May) to minimize the likelihood of disturbing denning female fishers. If conditions necessitate burning earlier than mid-May, efforts should be made to avoid treating areas that have high density of structures likely to be used by females for denning as stated in Zielinski *et al.* 2004. Alternative 3 incorporates both recommendations. This reduces the direct effect on denning habitat.

Truex and Zielinski (2005) recommend, whenever possible, managers should plan vegetation management activities in a manner that disperses treatments over space and time to minimize impact on individual fishers. Both action alternatives disperse treatments in space and time, but emphasize treatment in WUI.

Truex and Zielinski (2005) recommend, lastly managers must be willing to commit to long-term monitoring efforts to better understand the impacts of vegetation management activities on fisher and other wildlife. Monitoring should include both a habitat component such as the approach described in the paper as well as a population monitoring component. Monitoring research will be conducted by PSW.

Zielinski *et al.* (2004b) present a model which estimates the relative likelihood that a fisher will select a given site. They caution that "the objective of recruiting and retaining large trees should not overshadow, however, the goal of encouraging structural diversity; standard deviation of dbh was included in the Sierra model. This observation suggests that developing stands that include variation in the sizes of trees may be beneficial. We agree with Weir and Harestad (2003) that the maintenance of large structural elements at small scales may mitigate for the negative effects of large-scale alterations of habitat. However, we cannot at this time recommend standards for the optimal distribution of resting-structure types across a landscape." The uneven-aged silvicultural strategy creates more diverse structures through the maintenance of trees in many size classes and retention of large trees.

An objective was to identify areas that should be managed to maintain connectivity of old forest habitat areas within the KRP area as well as the rest of the Sierra NF to the north, east, and south. There are 4609 acres of OFL in the entire Kings River Project area. Of that there are 1085 acres of OFL within the initial eight management units.

Fire - Treated stands maintain more habitat: Stand replacing fire is a constant threat to fishers and their habitat. Model results indicate that following a fire, the number of suitable acres present within all eight management units will be 2862 for the No Action Alternative, 7160 for Alternative 1, and 7291 for Alternative 3. Suitable habitat is also predicted to develop more quickly post-fire under Alternatives 1 and 3.

Cumulative Effects for Fisher

The area considered in determining the cumulative effects of past, present, and reasonably foreseeable activities on fisher encompasses the Kings River Project Area, the Sierra NF, and the Southern Sierra Fisher Conservation Area (SSFCA), which is approximately 1,018,000 acres in size. This conservation area is defined by an elevational band from 3,500 to 8,000 feet on the Sierra and Sequoia National Forests and includes the known occupied range of the fisher in the Sierra Nevada (USDA 2001d:A-45). This is an appropriate scale for cumulative effects analysis because the SSFCA is an integral component of the conservation strategy described in the 2001 SNFPA ROD (USDA Forest Service 2001d:43). Maintaining the capability for movement and dispersal of fisher between southern Sierra Nevada populations and populations found in northern California is one of the key objectives of the SSFCA and is another reason why the SSFCA represents an appropriate scale for the analysis of cumulative effects.

Our discussion of cumulative effects will address the following seven topics:

1. Availability of suitable resting/denning habitat versus foraging habitat
2. A description of recent past, present, and reasonably foreseeable future activities
3. Disclosure of monitoring data for fisher at the scale of the Forest and the SSFCA
4. A review of the fire history dating back to 1916
5. A review of how past activities since about the mid-1960s have affected the landscape
6. An analysis of how timber harvest since 1978 has affected fisher habitat
7. A summary of detection and disturbance data for fisher

Availability of suitable resting/denning habitat versus foraging habitat: Within the SSFCA, we examined the availability of suitable resting/denning habitat versus foraging habitat. The availability of suitable resting/denning habitat is considered to be more limiting to fisher populations than the availability of foraging habitats (USDA Forest Service 2006). We used data presented by Freel (1992) to help inform the definitions of resting/denning versus foraging habitat (Table 3-31). Also, we validated these habitat definitions by comparing them to CWHR Version 8.1 (California Department of Fish and Game 2005) and discussing them with fisher research scientists (Dr. W. J. Zielinski, Dr. K. Purcell, and R. Truex, pers. comm., 21 Sept 2006). This discussion resulted in the identification of an alternative method for describing fisher reproductive habitat.

In general, we found Freel's (1992) definition for resting and denning habitat matched the CWHR's definition of reproductive habitat. However, we noted that CWHR's definition of foraging habitat included several "S" and "P" densities that were not used by Freel. Interestingly, the discussions with research scientists, particularly Dr. Zielinski, indicated recent field work shows fisher are using most CWHR types for foraging. Nonetheless, we retained the somewhat more restrictive Freel model for the sake of consistency of approach and did not include the S and P densities as foraging habitat. We do not believe this appreciably changes the habitat picture, since foraging habitat is clearly not limiting to fisher. The fisher scientists believe that reproductive habitat is limiting to fisher.

CWHR version 8.1 was used as a basis to define what we consider to be a minimum habitat map, based solely upon forest types, ages, and canopy densities listed therein as HIGH quality reproductive habitat. We further restricted the forest types considered to provide reproductive habitat from those listed in CWHR, based upon personal communication with Dr. Bill Zielinski (21 Sept 2006). This resulted in the elimination of the following types: aspen, eastside pine, lodgepole pine, red fir, and subalpine conifer. This generated a more restrictive map of high quality reproductive habitat.

Applying the Freel (1992) definition from Table 3-31 to the various scales of analyses, we find that the current amount of resting/denning habitat in the Kings River Project area for the initial eight management units is 2.0% and 1.1% of the total available throughout the Sierra National Forest and the SSFCA, respectively (Table CE2). Furthermore, under the Proposed Action and Reduce Harvest Tree Size Alternatives, the proportion of suitable habitat composed of resting/denning habitat changes from 92% currently to 96% in 10 years and 98% in 20 years, assuming no fire occurs (Tables CE2 and CE3). Although resting/denning habitat would decline by 9-10% following treatment, the habitat is expected to recover in 10 years under the Reduce Harvest Tree Size Alternative and in less than 20 years for the Proposed Action. In the event of a wildfire, the differences within the Kings River Project area between the No Action alternative and the treatments under the Proposed Action and the Reduce Harvest Tree Size Alternative are dramatic. Corresponding data are presented in Table CE2 for the two definitions of describing fisher habitat. Data are not currently available to project habitat acres over time for scales larger than the Kings River Project Area.

Table CE2. Acres of suitable fisher resting/denning habitat within the Kings River Project area, the Sierra and Sequoia National Forests, and the Southern Sierra Fisher Conservation Area (SSFCA). In all instances, a range of numbers is provided, with the lower value representing the number calculated using the CWHR 8.1 Modified habitat definition and the larger value representing the number calculated using Freel (1992).

Fisher		**Acres of Suitable Fisher Resting/Denning Habitat Definition: See Table 3-31**					
				Year 10		**Year 20**	
Scale	**Alternative**	**Pre-Project**	**Post-Project**	**Without Fire**	**With Fire**	**Without Fire**	**With Fire**
Kings River Project	Proposed Action	2779 to 9050	1834 to 8135	2178 to 9007	1341 to 7222	2783 to 9490	1684 to 7796
	No Action	2779 to 9050	2779 to 9050	3770 to 10,294	1078 to 2873	5165 to 10,726	1399 to 3056
	Reduce Harvest Tree Size	2779 to 9050	1917 to 8202	2216 to 9123	1358 to 7353	2796 to 9547	1711 to 7849
Sierra National Forest	**N/A**	321,000 to 449,000					
Sequoia National Forest	**N/A**	164,700 to 334,700					
SSFCA	**N/A**	485,700 to 783,700					

Table CE3. Acres of suitable fisher foraging habitat within the Kings River Project area, the Sierra and Sequoia National Forests, and the Southern Sierra Fisher Conservation Area (SSFCA). Only acres that do not qualify as resting/denning are shown.

Fisher		**Acres of Suitable Fisher Foraging Habitat Definition: See Table 3-31**					
				Year 10		**Year 20**	
Scale	**Alternative**	**Pre-Project**	**Post-Project**	**Without Fire**	**With Fire**	**Without Fire**	**With Fire**
Kings River Project	Proposed Action	823	814	331	57	204	79
	No Action	823	823	494	5	513	7
	Reduce Harvest Tree Size	823	796	328	57	204	79
Sierra National Forest	**N/A**	31,911					
Sequoia National Forest	**N/A**	29,194					
SSFCA	**N/A**	61,105					

Past, Present, and Reasonably Foreseeable Activities

Past, present, and reasonably foreseeable activities on the High Sierra District are described at the beginning of Chapter 3 of the FEIS. The scale for cumulative effects also includes the Sierra National Forest (which includes the Bass Lake District) and the entire SSFCA.

In addition to the site-specific analysis of the eight management units, this EIS also addresses the establishment of 10 KRP management units as no-treatment controls, and the treatment of one unit (South of Shaver) under an existing decision that would degrade 142 acres of suitable habitat (122 ac from 4M to 4P and 20 ac from 4D to 4M).

The ongoing federal management activities within the Kings River Project area (all of which have already had their NEPA completed) that extend in time through the treatment of the initial eight management units and overlap them involve:

- The High Sierra Ranger District prescribed burn program of work (Figure 2, Chapter 3 of the FEIS), which will have no effect on the fisher, as explained below;
- Other Sierra National Forest timber and culture projects (Figure 2, Chapter 3 of the FEIS). These activities include plantation maintenance projects that have been determined to have no effect on the fisher and roadside hazard tree removal that may remove some legacy structures (e.g., snags) preferred by fisher;
- Active cattle allotments (Figure 3, Chapter 3 of the FEIS) that will have no effect on the fisher; and

- Recreational activities and events (e.g. off-highway vehicle and off-snow vehicles) (Figure 4, Chapter 3, FEIS) that may cause some disturbance to any fisher that may be present at the time the activities take place.

The ongoing activities on private land (Figure 5, Chapter 3, FEIS) within the Kings River Project area involve:

- Two potential timber sales near the n_soapro_2 management unit that are in the early stages of planning, so effects are not yet known;
- A housing development north of the sos_1 management unit, involving about 80 acres of land development;
- The Southern California Edison (SCE) timber management area that will have no effect on the fisher; and
- The Pacific Gas & Electric (PG&E) transmission line corridor maintenance that will have no effect on the fisher.

On the Bass Lake District, there is one present project (Sunny Meadows South – 1,400 or more acres of commercial thinning that will not result in changes to suitable habitat) and two reasonably foreseeable projects (Sunny Meadows North with 955 acres of treatments and Cedar Valley with approximately 2,680 acres of commercial thinning) that could influence the cumulative effect on fisher habitat. While Sunny Meadows North will not result in any changes in suitable habitat, the Cedar Valley project may result in a reduction in quality of suitable habitat on about 816 acres, where suitable habitat may change from 4D to 4M. On the High Sierra District, there is one present project (Jose Basin 1 – 1,263 acres of commercial thinning) where habitat would be degraded on 60 acres and eight acres of foraging habitat would be lost.

Other projects on the Bass Lake District include:

- Cattle allotments, prescribed burn program on 1,800 acres since 1994, and plantation maintenance, all of which will have no effect on the fisher
- Various recreational activities and events and roadside hazard tree removal activities since 2003, both of which will cause some disturbance to fisher or remove legacy structures

Within the remaining portion of the SSFCA, additional past, present, or foreseeable projects also occurred on the Sequoia National Forest/Giant Sequoia National Monument. In total, the Biological Evaluations for 70 past projects on the Sierra and Sequoia National Forests dating back to 1992 were reviewed for information that could describe cumulative impacts to the fisher.

The Sequoia National Forest released a quarterly Schedule of Proposed Actions for the period from 1 July - 30 September 2006; this schedule includes recreation, vegetation, fuels, and special use management projects. Although some of the projects on this list are within or on the periphery of suitable fisher habitat, detailed effects analyses were not yet available at the time of this writing. Four additional timber sales on the Sequoia National Forest (Saddle Helicopter, Ice Helicopter, White River Helicopter, and Frog Thinning) have been proposed. During its review of the Saddle Fuels Reduction project, the Fish and Wildlife Service examined the cumulative effects encompassing a 434,000-acre analysis area and including the effects of the White River, Ice, and Saddle fuels reduction projects; approximately 3,150 acres were identified for treatments between these projects

(U.S. Dept of Interior 2005). In its review of the potential effects of the Saddle Fuels Reduction Project, the U.S. Dept of Interior (2005) noted that "[C]atastrophic wildfires in the southern Sierra Nevada have destroyed fisher habitat and may result in injury or death of fishers." They also determined that the proposed project would not likely result in adverse effects to the fisher.

Subsequent to the USFWS' review of the Saddle project, a lawsuit resulted in halting any future work on the Saddle, Ice, White River, and Frog Thinning projects. According to current direction (dated 6 Sept 2006) on the Sequoia Forest/Monument, all activities proposed under the Environmental Assessments for these four timber sales are permanently enjoined and other projects may proceed but only if consistent with the Land and Resource Management Plan as amended by the SNFPA 2001 ROD and the Mediated Settlement Agreement. Outside of the Monument, the LRMP guidelines as amended by the SNFPA 2004 ROD are to be followed.

Collectively, all of the above-mentioned projects have the potential to affect the fisher and its habitat. For example, three commercial thinning and/or fuels reduction projects took place in the KRP area (Reese, 10S18 and I-Rock) after the change in timber management emphasis to commercial thinning in 1992. Generally, they reduced basal area to about 60% of full stocking and canopy cover to about 40% in ponderosa pine stands and 50% in mixed conifer stands, so the pre-treatment condition of the stands most likely represented foraging habitat for fisher. Stream Management Zones along perennial streams (100 feet on both sides) were not thinned so the best and preferred resting and denning habitat was not changed.

Over the last ten years, a slight increase in the acreage of suitable fisher habitat (as defined by Freel 1992) has been noted on the Sierra National Forest, even after considering the effect of commercial thinning/fuel reduction projects (such as the three projects described above) and post-1978 plantation maintenance (as described later) on basal area, canopy cover, or other suitable habitat attributes. Because of the large fires on the Sequoia, the trend there is masked.

The High Sierra underburning program schedule of work, displayed in Table 3-13, has approximately 17,300 acres planned under current decisions. These underburns are proposed for maintenance of DFPZs, reducing surface fuel loads, and reintroducing fire into the landscape. Burns are typically low intensity burns conducted in the spring. Scorch heights are typically less than 15 feet. Surface flame lengths are typically less than two feet. Based on our experience with these parameters, these prescribed burns do not change the suitability of fisher habitat in the KRP area (e.g., because prescribed burns occur in the winter and/or spring, large down logs or snags that have moisture in them don't burn under these conditions).

Biological Evaluations for many of the projects listed above were reviewed to help inform the present analysis. Our review of these documents revealed the following basic information about effects to fisher from these activities:

- Seventy (70) total project Biological Evaluations (BEs) were reviewed, dating back to 1992 on the Sierra and Sequoia National Forests

  - This total includes 47 BEs on the Sequoia National Forest and 23 BEs on the Sierra National Forest
- Determinations reached were:
  - No effect – 17 BEs, (14 on the Sequoia NF and three on the Sierra NF)
  - May affect individual fishers, but not likely to lead to a trend toward federal listing or loss of viability – 43 BEs (27 on the Sequoia and 16 on the Sierra)
  - May affect individual fishers, and likely to lead to a trend toward federal listing or loss of viability – 0 BEs
  - Fisher was not addressed due to lack of habitat and/or no determinations for fisher were made in the document we reviewed – ten BEs (six on the Sequoia NF and four on the Sierra NF)
- Types of Projects: Salvage, underburning or prescribed burn, hazard tree removal, fuels reduction projects, or thinning/sanitation treatments were the proposed activities that were most often represented in the sample
- Relative to "May Affect" projects, the described impacts to fisher most often fell into the following categories
  - Noise or other types of disturbance
  - Reduction of legacy structures (e.g., snags, canopy cover, or down woody debris) or "degradation" of denning habitat such that it is converted to foraging habitat
  - Quantified loss of suitable habitat, with amounts usually ranging from 0 to 60 acres per project. The White River Analysis Area BE described a greater quantity of habitat loss (i.e., 250 – 320 acres), but that project is now permanently enjoined, as explained above

The most informative part of this exercise is that although more than 60% of the activities proposed by the Forest Service within the SSFCA planning area since 1992 had been determined to have some effect on the fisher, nearly all of the described effects were small in scale compared to the 1,018,000 acres within the SSFCA (e.g., a typical planning area for one of these projects might approach 5,000 acres – which is less than 0.5% of the size of the SSFCA). While these project activities may have the potential to influence long-term trends in vegetation change across a landscape, an argument can be made that other factors play a much larger role in the causes of past and foreseeable landscape vegetation changes.

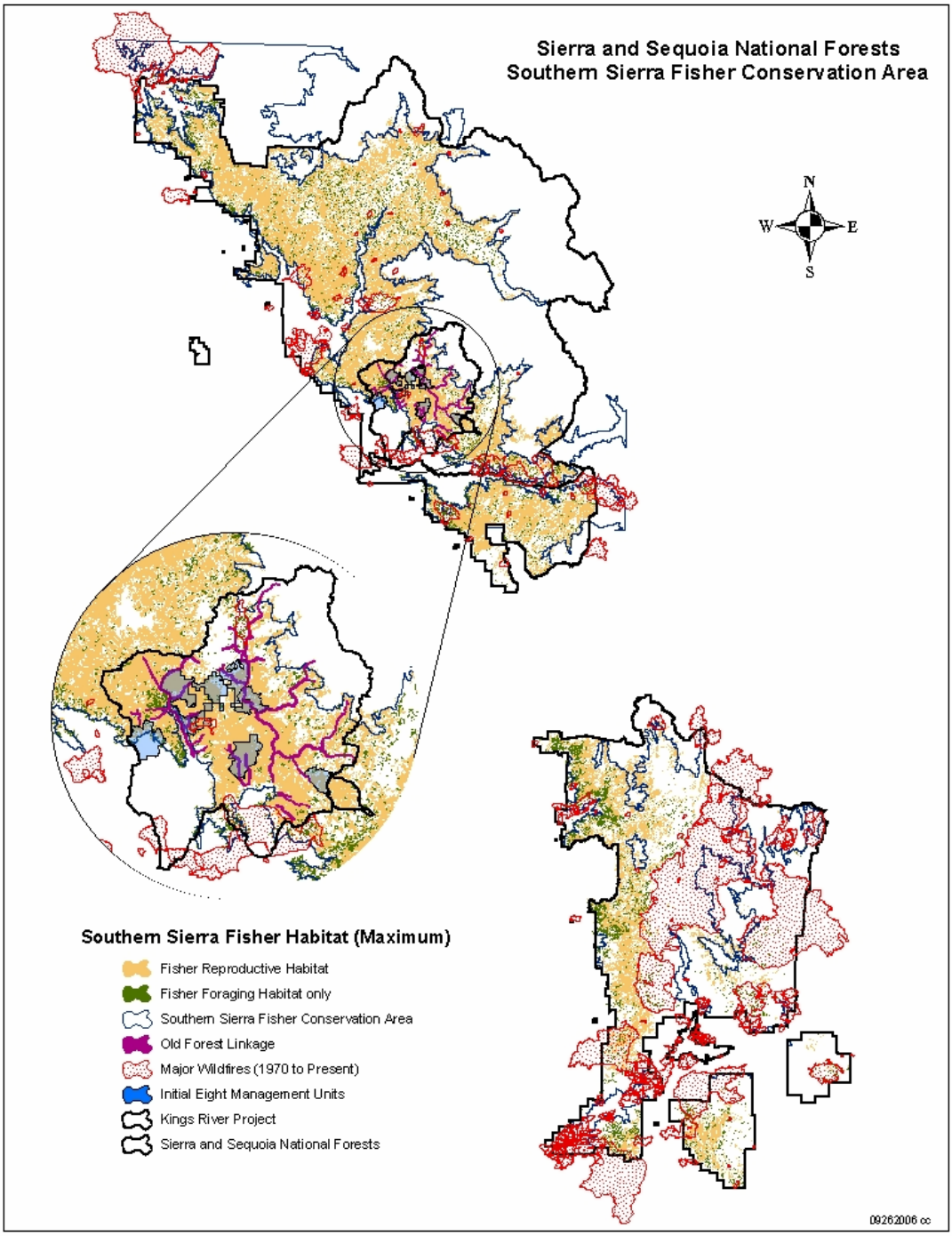
California's Fire and Resource Assessment Program: California state law (Public Resource Code 4789) requires the Fire and Resource Assessment Program (FRAP) of the California Department of Forestry and Fire Protection (CDF) to periodically assess California's forest and rangeland resources. This assessment is performed in cooperation with federal, state, and local agencies, public and private organizations, and California's academic research community (CDF 2006). In its latest assessment, the CDF (2006) estimates, on average, that a quarter-million acres of forest and rangeland are burned annually via wildfires.

In cooperation with the Forest Service, the CDF developed the California Land Cover Mapping and Monitoring Program which measures and maps changes in vegetation cover. In its 2003 report, the CDF (2006) reported that between 1990 and 1995, the southern Sierra Nevada showed little to no change in forest canopy or vegetation cover across 90-99 percent of all forest and rangeland areas. Changes that were reported include, but are not limited to, the following:

- Large decrease in vegetation cover on 20,000 acres
- Small decrease in vegetation cover on 139,000 acres
- Little to no change in vegetation cover on 12,194,000 acres
- Small increase in vegetation cover on 833,000 acres
- Large increase in vegetation cover on 44,000 acres

In general, acres with increases in forest and rangeland cover exceeded decreases in the southern Sierra by a factor of 5:1. The southern Sierra area also had a 13% increase in vegetation cover within hardwoods, which was attributed to the re-growth of hardwoods, shrubs, and grasses following large fires (CDF 2006). Oaks are considered important in helping female fishers to meet their cover and food needs throughout their home range (Zielinski et al. 2004b).

The causes for change in vegetation cover are also tracked by the Land Cover Mapping and Monitoring Program. Fire was responsible for 47%, 36%, and 13% of the vegetation change in the Northeastern, North Coast, and Southern Sierra areas of the monitoring program (CDF 2006), respectively. Indeed, in all cases, fire was responsible for more changes in vegetation cover than was harvest; in the Southern Sierra, harvest accounted for only 6% of the changes noted in vegetation cover during the 1990-1995 period. Railroad logging in the late 19th century may have contributed to fragmentation and isolation of fisher populations; however the response of fisher populations to the resultant habitat changes is not quantified (Zielinski *et al.* 2005). Given these observations, we assumed that fire has historically been the dominant factor responsible for changes in vegetation throughout the analysis area. With this in mind, we created a map that displays current distribution of suitable habitat juxtaposed to the areas of large wildfires (i.e., wildfires 40 acres or larger in size) that have taken place over the last 36 years. Two versions of this map are provided on the following pages, corresponding to the two habitat definitions described in Table 3-31. The “Maximum” map employs the Freel (1992) habitat definition while the “Minimum” map employs the CWHR 8.1 Modified habitat definition.


Sierra and Sequoia National Forests
Southern Sierra Fisher Conservation Area
N
W
E
S
Southern Sierra Fisher Habitat (Maximum)
Fisher Reproductive Habitat
Fisher Foraging Habitat only
Southern Sierra Fisher Conservation Area
Old Forest Linkage
Major Wildfires (1970 to Present)
Initial Eight Management Units
Kings River Project
Sierra and Sequoia National Forests
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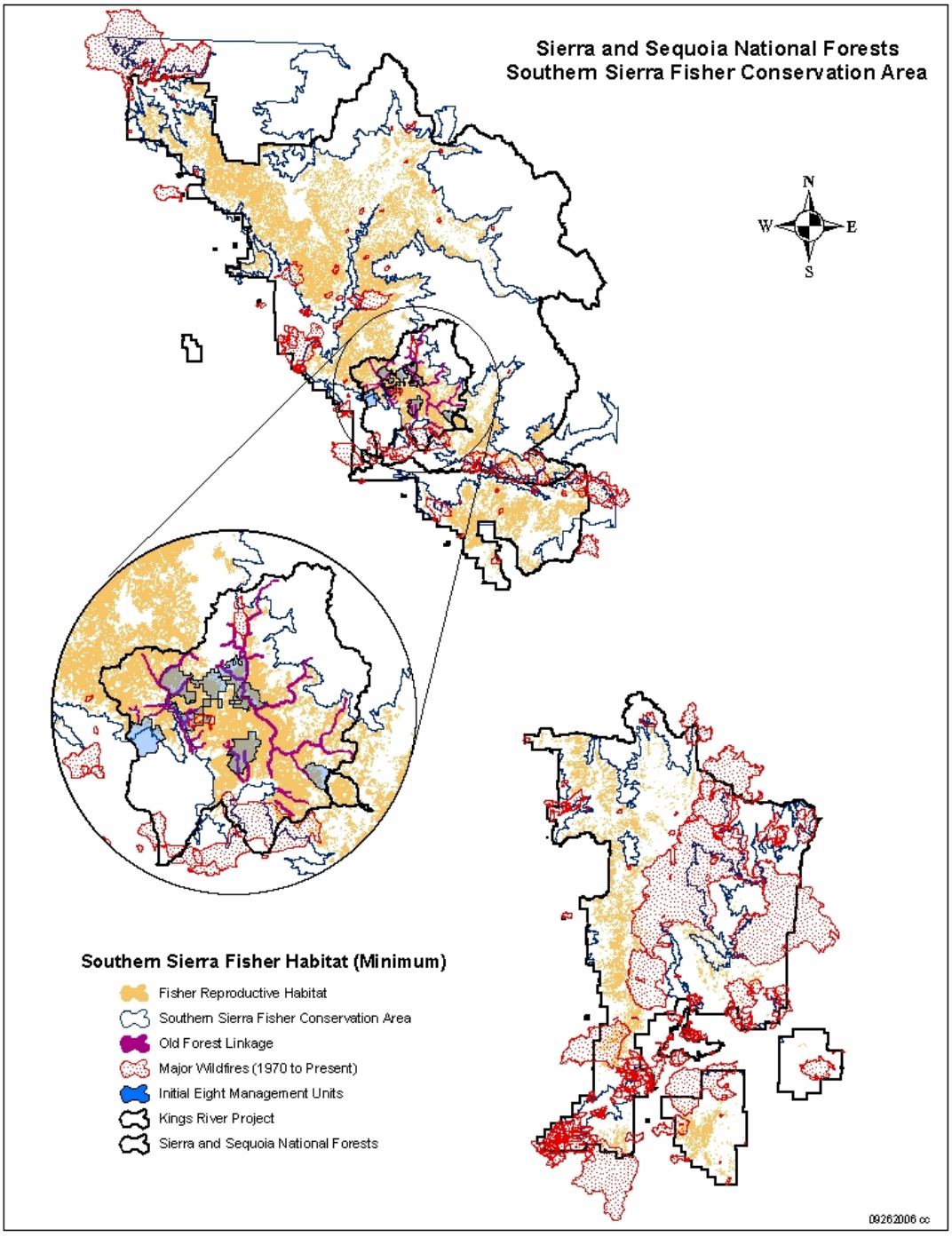


These maps clearly show the majority of large fires during this time period have occurred on the Sequoia NF, where the recent Manter and McNally fires have removed large blocks of suitable habitat (e.g., 6,000 ac of suitable fisher habitat was lost due to the Manter fire alone). Visually, the map shows a correlation between the location of large wildfires and the absence of suitable habitat (i.e., in many places where large wildfires have occurred in the recent past, suitable habitat is no longer present or occurs in small quantities). On the Sierra NF, fewer wildfires have occurred and, interestingly, a

noticeable proportion of these wildfires have taken place outside of or below the elevational band that defines the Southern Sierra Fisher Conservation Area. Implementing the proposed action (the initial eight management units) at locations that are distant from the fragmented landscapes where the majority of the larger wildfires have occurred is likely to incur less risk to the fisher. As displayed on the map, the continuity of habitat surrounding the initial eight management units is more clearly defined on the Sierra NF compared to the habitat continuity in existence on the Sequoia NF. That being said, the locations of the initial eight management units occur within a relatively narrow band of fisher habitat that creates a bottleneck for north to south movement of populations (i.e., proposed activities in this location have the potential to reduce the permeability of the Kings River Project area with respect to fisher movements). To address this, the Old Forest Linkages are designed to maintain habitat corridors and provide refugia containing the highest quality of habitat, thereby allowing fisher to move through the Kings River Project area to other points in all directions, especially north or south (see maps on the foregoing two pages). The large wildfire polygon on the northwest corner of the map actually occurred on the Stanislaus NF and is likely to affect northward dispersal of fisher.

Given the past actions there is a risk with proceeding with the implementation of the Kings River project, especially since impacts will occur within CWHR 4D stands, which are considered by Zielinski et al. (2004b) to comprise the greatest proportion of fisher home ranges; however, given the objectives for reducing fire risk across the landscape and the specific conservation measures that are part of the Reduce Harvest Tree Size Alternative, the impact that wildfires may have in the future on fisher habitat and populations may be lessened by application of the proposed treatments. One of the challenges in assessing the effects of fire management on fisher habitat is the need to weigh the long-term benefits of the reduction of risk of catastrophic fires against any potential short-term effects on the quality or quantity of fisher habitat. Even greater emphasis must be placed on this because the fisher is only found in less than half the range it occupied in the early part of the 1900s (Zielinski et al. 2004b).

Parks and Rojas (2006) created spatially explicit animations of fisher habitat (as defined by Freel (1992)) before and after treatments in the initial eight management units. These animations are provided on the Sierra National Forest website (http://www.fs.fed.us/r5/sierra/projects/) and show how some of the management units (e.g., bear_fen_6 or el_o_win_1) have an abundance of high quality suitable habitat and low levels of fragmentation while other units (e.g., glen_mdw_1, krew_bul_1, or n_soapro_2) exhibit a scarcity of high quality suitable habitat or greater degrees of fragmentation. Proposed activities in management units fitting this latter category may pose a slightly higher risk to fisher.

At a programmatic level, the next areas in the KRP expected to be treated after the initial eight management units are not adjacent. There are fewer disturbances in an area when treatments are not adjacent to each other. Through the KRP adaptive management approach, as appropriate, the treatments will be refined to accommodate what is being found through monitoring and research. Future management units have been specifically designed to be no more than 1/3 the size of any fisher home range. Treatment of them is

separated in space and time to further reduce impacts on an individual fisher. The expected treatment of future units is scheduled so that no adjacent management units will be treated within a 5-year period.

Disclosure of monitoring data for fisher at the scale of the Forest and the SSFCA: Using camera traps, the density of fishers in the study area (an area smaller than the District but larger than KRP) was estimated to be 13 fishers per 100 km^2 in 2002 (Jordon, M. unpubl. data) and 10 fishers per 100 km^2 in 2003 and 2004 (Jordan, M. et al. 2005). The abundance estimates for the time period were 47, 42, and 44 individuals from 2002 through 2004, respectively (Jordan, M. et al. 2005). As at the forest scale, fisher may have increased their spatial distribution on the District and in the KRP area. According to Purcell (pers. comm. 2006), an estimated 28-36 individual fisher inhabit the KRP area and it is thought the numbers are stable.

The Southern Sierras are the southernmost range of fishers known at this time. Although fishers appear well distributed in the Sierra NF (U.S. Dept. of Interior. 2006c), monitoring data suggest that fishers are approximately half as dense here as in the Sequoia NF. Moreover, population persistence of fisher in the Southern Sierras is threatened by a number of population, habitat, and environmental factors (Lamberson, et al. 2000). Available data suggest that high quality habitat for fishers, especially forest with canopy cover >60%, is present at lower densities in the KRP area than in Sequoia NF.

However, Landsat thematic mapping (2001) for the Sequoia National Forest (SQF) shows, between 3500 to 8000 feet in elevation, that 364,00 total acres are suitable fisher habitat. On the Sierra National Forest (SNF) for the same elevations, Landsat mapping shows that 481,000 total acres are suitable fisher habitat. Within the KRP 9,873 total acres are suitable fisher habitat. While population information described above indicates lower fisher densities in the KRP area than the SQF, habitat information shows a higher percentage of suitable fisher habitat on the HSRD and KRP than on the SQF.

Consistent with lower habitat quality in the KRP area, the average home range of radio-tracked female fishers was more than twice as large on the Sierra NF as compared with the Sequoia NF (Mazzoni 2002; Zielinski et al. 2004b). Comparisons of estimated densities of fishers in the KRP area with similar data collected elsewhere place KRP fisher densities at the low end of values observed in occupied habitat. The proportion of females showing evidence of breeding annually is also at the low end of the documented spectrum (Mark Jordan, University of California, pers. comm. 2006). These monitoring data emphasize the importance of the adaptive management component of the Kings River Project; that is, activities conducted in areas of lower habitat quality and lower population densities must be monitored closely to detect undesirable changes at the earliest possible opportunity.

A review of the fire history dating back to 1916: The Kings River Project has a recorded fire history dating back to 1916. Since then, thirty fires larger than 40 acres have occurred (either entirely or a portion of the fire) within the project area. The average size of wildland fires in KRP in the last 35 years is 1,866 acres. With the exception of the 1981 Rock Creek fire, which started in the upper reaches of the Dinkey Creek drainage, the

majority of large fires (greater then 3,000 acres) started in chaparral or in the grassy lowlands of the Kings River drainage, and have run uphill into the forested areas. The largest fire – the 1961 Basin fire – started in the low elevation grasslands of the Dinkey Creek drainage and grew to 19,421 acres in four days before terrain moderated it. The 1961 Haslett Fire grew to over 3,000 acres in one burn period before hitting Fence Meadow ridge. Since 1916, ten fires were larger than 3,000 acres.

As discussed above, we believe that large wildfires have played a dominant role in shaping the current landscape for fisher in the southern Sierra Nevada. The fire history on the Sierra and Sequoia NFs, combined with recent large fires on the Stanislaus National Forest, raise concern for the ability of individual fisher to travel between the southern Sierra and other, more distant populations in northern California.

The statistical probability (rare event occurrence – Poisson probability distribution) of a large fire occurring within the KRP area within the next 30 years is 11% and any fire occurrence within the next 10 years is 36%. With current stand conditions, a wildfire of stand replacing intensity (97th percentile conditions) would become an active crown fire from the first spark. In such an event, the effectiveness of aerial suppression capabilities is limited due to existing stand densities and fuel loading.

A review of how past activities since about the mid 1960s have affected the landscape: Since about the mid-1960s, past activities within Sierra National Forest and the KRP planning area have included clearcutting and salvage logging (1960s - 1972), sanitation and salvage harvests (1972 - 1978), clearcutting, shelterwood cutting, and salvage harvests (1978 - 1992), and commercial thinning and salvage in recent times. The only fires to burn substantial amounts of timber were the Rock Fire in 1981 and the Big Creek Fire in 1995, with each fire burning about 3,000 acres of forest. Clearcuts or areas that burned prior to 1972 are most likely successful plantations today exhibiting size class 3 and density class M stands. Other, more recent disturbances, while they may be reforested, have probably not yet reached size class 3. This overview of plantations is a good measurement for the effects of regeneration cutting on fisher habitat. Overall, about 9,000 acres of disturbance resulting from timber sale activity or fires have taken place within the KRP planning area, and approximately 23,000 acres of disturbance have been documented for the larger area encompassing the Kings River and Pine Ridge Ranger Districts since about 1978 (Mark Smith, pers. comm.).

On the Sequoia National Forest, clearcutting, shelterwood cutting, and salvage harvests accounted for about two-thirds and overstory removal cutting accounted for about one-third of the timber management activity from the mid-1960s to about 1988. At the end of this period, the Forest switched to commercial thinning and salvage, driven to change by controversy over removing white woods from Giant Sequoia groves. (Glen Duysen, pers. com.) Similar to the Sierra, an overview of plantation establishment and growth is a good measurement for the effects of regeneration cutting on fisher habitat on the Sequoia.

An analysis of how timber harvest since 1978 has affected fisher habitat: At the Forest scale, timber harvest from the Sierra Forest has declined from an average of 126 MMBF in the 1980s to an average of 7 MMBF since 2000. At the same time, harvest on private

lands has remained relatively stable within the Forest boundary at about 5 MMBF annually. Declines in timber harvest affect the fisher in several ways. Declining harvest frequently means fewer disturbances in the woods and a greater opportunity that any given female fisher will breed and rear its young without substantial interference or disturbance. On the other hand, declining timber harvest also reduces the available funds for forest restoration and habitat management. The more recent disturbances (post-1978) described in the previous paragraph, which have almost all been reforested, have resulted in the following acres of plantations:

The acreage of plantations created since fiscal year 1978 (as recorded in the FACTs Database) on the Sierra and Sequoia National Forests[10]

Unit	Gross Acres	Acres Planted
Old Mariposa District	12,397	5,958
Old Minarets District	15,615	7,649
Old Kings River District	10,186	6,701
Old Pine Ridge District	13,169	9,613
Sierra NF Totals:	**51,367**	**29,921**
Sequoia NF Totals:	tbd	tbd

The LRMP specified stand types and a specific percentage of acres of each type that were to be targeted for regeneration. Generally, stands that were at lower stand density, i.e., canopy closure, were planned for about half the regeneration target to increase the productive capacity of the Forest as fast as possible. The other half of the regeneration target was planned in well stocked stands to sustain a high level of annual volume production from the Forest. So, about half (50%, or 26,000 acres) of the gross acreage of plantations was created from stands that were not suitable fisher habitat and about half was suitable habitat when the stand was regenerated. Although these disturbances have caused notable changes in wildlife habitat, the amount of these changes over the last 30 years is not extraordinary compared to the total amount of suitable fisher habitat that is available. (See following paragraph.)

As described in the draft Forest MIS Report for the Sierra Forest (USDA Forest Service 2006), fisher resting/denning habitat – as defined by Freel (1992) – has increased slightly on the Forest from 422,000 acres about ten years ago to 449,000 acres presently. The detection rate of fisher (based on systematic, large-scale surveys conducted between 2002 and 2006) on the Sierra Forest is roughly half what it is on the Sequoia Forest. Fisher may have increased their spatial distribution on Sierra Forest since the mid-1990s. The annual occupancy rate within the Sierra Forest seems to be consistent, though the spatial pattern of detections appears more variable among years than on the Sequoia Forest (Rick Truex, USFS, pers. comm. 2006).

[10] Note: Minarets and Mariposa Ranger Districts are now collectively known as the Bass Lake Ranger District; and the Kings River and Pine Ridge Ranger Districts are now collectively known as the High Sierra Ranger District.

The combination of a stable or slightly increasing amount of suitable fisher habitat on the Forest over the last ten years, and perhaps an increasing spatial distribution of fisher, make it reasonable to conclude the cumulative effects of vegetation management activities on the Forest have not affected viability of the fisher; however, given the uncertainty inherent in these data, other alternative (and perhaps conflicting) conclusions are also possible. For example, this information could suggest considerable movement of individuals either dispersing or seeking to meet habitat requirements, implying that habitat quality may be lower than the CWHR model predicts.

Timber harvest has declined at similar rates at both the Kings River Project and Forest scales. Harvest on private lands has remained relatively stable within the High Sierra District and the KRP area. So, the effects of timber harvest on fisher at the project scale are similar to those effects presented at the Forest scale. Suitable fisher habitat on the District has increased slightly from about ten years ago to 239,000 acres presently. The more recent disturbances (post-1978) described above, which have almost all been reforested, have resulted in the following acres of plantations on the District and the KRP area:

The acreage of plantations created since fiscal year 1978 (as recorded in the FACTs Database) across the Kings River Project area and the High Sierra Ranger District (which was formed from the old Kings River and Pine Ridge Ranger Districts):

Unit	Gross Acres	Acres Planted
Kings River Project	9,129	5,688
Old Kings River District	10,186	6,701
Old Pine Ridge District	13,169	9,613

Overall, about 9,000 acres of disturbance resulting from timber sales or fires have taken place within the KRP planning area and approximately 23,000 acres of disturbance have been documented for the larger area encompassing the old Kings River and Pine Ridge Ranger Districts since about 1978.

Three commercial thinning and/or fuel reduction projects took place in the KRP area (Reese, 10S18 and I-Rock) after the change in timber management emphasis to commercial thinning in 1992. Their effects on fisher habitat have been described above in the section on **Past, Present, and Reasonably Foreseeable Activities**.

Figure 3-55 addresses the cumulative effects from change in canopy cover on fisher habitat in the initial eight management units. The current landscape condition is that forty six percent of all acres with medium and larger trees have greater than 50 percent canopy cover. After thinning, the acres meeting this canopy cover condition recovers in less than ten years across the landscape to about 50 percent for the action alternatives, assuming no fire occurs, which meets the fisher habitat goal for the proposed action[11]. In 20 years, the acres meeting this canopy cover condition reaches 60 percent for the action alternatives, again assuming no fire or other vegetation management activities occur, which meets the fisher habitat goal for the Reduce Harvest Tree Size alternative[12].

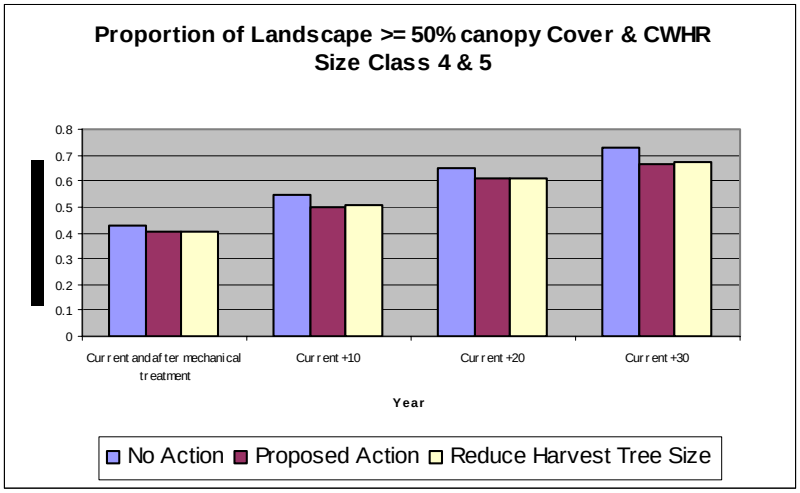


Figure 3-55 displays the proportion of acres across the Kings River Landscape that meets the fisher goal throughout the analysis period.

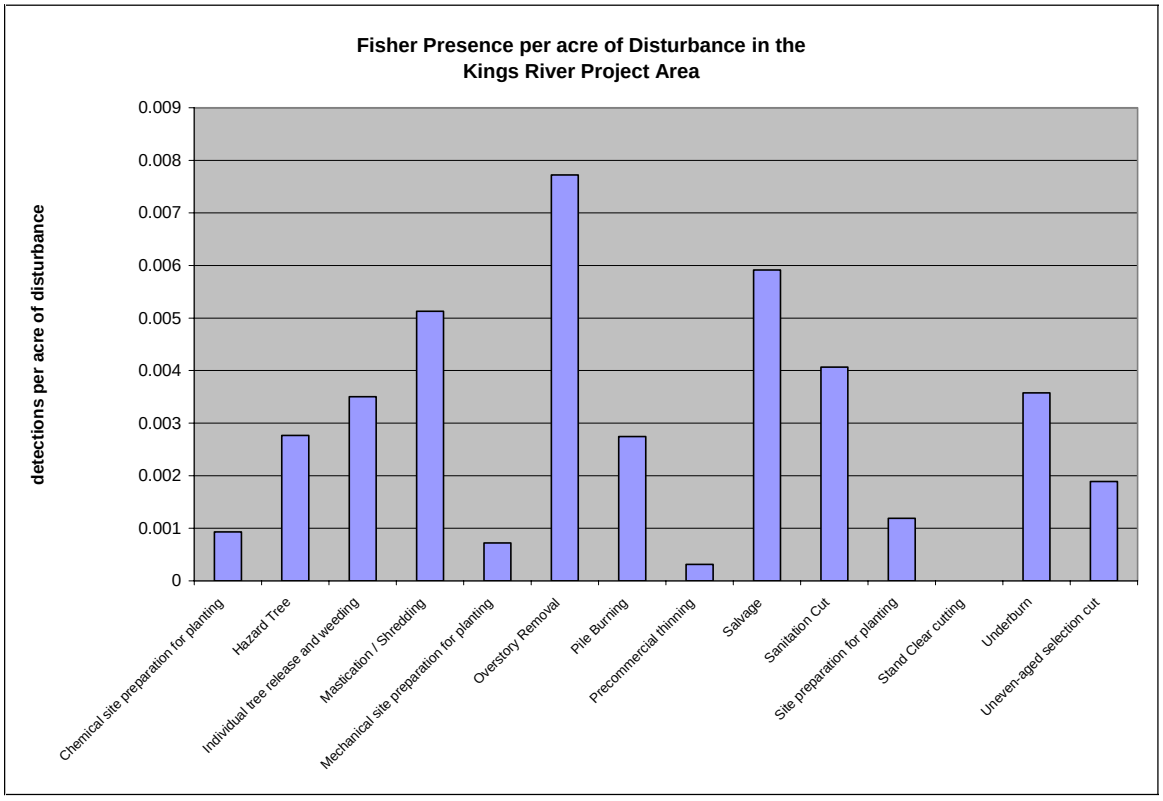
A summary of detection and disturbance data for fisher: The chart and table below present information about fisher detections in areas following various types of disturbance. The key variables include the period of analysis (1993 - 2005), acres of treatment, and the number of fisher detections following treatment. In effect, the chart displays the number of detections per acre for each disturbance type. For example, the uneven-aged selection cut had six fisher detections in 3,171 acres that were disturbed by this treatment. This resulted in 0.002 detections per acre of disturbance. Interestingly, if one takes all the detections in the KRP by Jordan et al. (2005) and Mazzoni (2002) (818) and divides by the total acres between 3,500 feet and 8,000 feet in elevation (86,083 acres) the result is 0.010 detections per acre. Precommercial thinning (< 0.001 detections per ac) and the site preparation (about 0.001 detections per ac) treatments are connected to previous clearcuts. The release treatments (about 0.0035 detections per ac) are also associated with previous regeneration harvest. While it is debatable whether this indicates a trend in avoidance or preference, it does allow for comparison of detections based on the amount of disturbance. Interesting are the release and weeding treatments that have a longer time frame for the detection of a fisher than uneven-aged selection, but the release and weeding have more detections (refer also to Table 6). That is, more detections occur following release and weeding treatments but it takes longer for the detections to occur after treatments than uneven-aged selection. Even though release and weeding treatments

[11] The long-term habitat goal is to develop or maintain 50% of the area of potential fisher habitat in CWHR Class 4 (11-24 in dbh) or higher with 50% canopy cover or greater

[12] The long-term habitat goal for Alternative 3 is to develop or maintain 50% of the landscape outside of WUI with canopy density >60%

occur in large openings, sufficient cover in young trees and brush may return after 6 - 10 years.

We acknowledge in advance that the source of the data for the following graph and table is a convenience sample with an unknown precision or confidence interval. Given that caveat, the data appear to indicate that fishers do not avoid underburned areas, for example, and are detected more often than in areas where pile burning occurs; and that the range in time since dispersal is similar for both underburning and pile burning (0 - 10 years for underburning, and 0 - 9 years for pile burning). If we discuss the qualitative aspects of each disturbance and relate it to known suitability for fishers, then we could also say that treatments that result from larger openings (precommercial thinning, site preparation) have fewer detections than those with scattered tree removal such as sanitation cut, mastication, and salvage. The scattered treatments are those that create small amounts of change in habitat suitability for cover, and those associated with larger openings represent large changes in habitat suitability for cover.



These fisher detections infer presence only and no conclusions may be drawn regarding absence. This is because the disturbance and the detection were done independently. As a result, presence following disturbance is the only inference that can be drawn. Because the data are reported on a detection-per-acre basis, the reader should exercise caution in interpreting the results. For example, the number of detections per acre is greater in salvage polygons, while fewer detections per acre occurred in precommercial thinning. While it may be tempting to infer a preference for salvaged areas, the large number only indicates the large size of salvage polygons and the relatively large area disturbed by

salvage. The opposite is true for overstory removal cut. That is, these areas are small polygons and occupy a small portion of the KRP, thus few detections occurred in these polygons.

The table below displays the same detection and disturbance data, but with a time range that represents the maximum and minimum years between the disturbance and the detection. Thus, for uneven-aged selection cuts there were six detections following the treatment, and the maximum time between disturbance and detection was three years. The minimum time occurred within the same year of disturbance, or about 0.42 years. A display of average time is not appropriate since it does not account for the size of polygons or the area of the treatments across the KRP. The inference is that fisher return to disturbed areas (at least for the time periods examined) and they are detected at different times since disturbance. **Since we did not go out and sample each disturbed area each year after disturbance, all we can say is that fishers have either remained in or reoccupied these areas within the specified time period.** The time range does not represent a fisher return interval, but simply the time between detection and disturbance (treatment). Fishers may have been there sooner, but we did not go out and sample. **Since no detections occurred in stand clear cutting, we might be able to say that fishers are excluded from these large openings.**

Treatment Type	Number of Fisher Detections	time range since presence detected (years)	Acres
Chemical site preparation for planting	1	1 to 1	1075
Hazard Tree	14	5 to 0	5063
Individual tree release and weeding	16	10 to 6	4567
Mastication / Shredding	1	2 to 2	195
Mechanical site preparation for planting	2	2 to 1	2771
Overstory Removal	2	7 to 7	259
Pile Burning	7	10 to 0	2550
Precommercial thinning	1	2 to 2	3218
Salvage	131	10 to 1	22145
Sanitation Cut	1	2 to 2	246
Site preparation for planting	1	1 to 1	841
Stand Clear cutting	0	to	0
Underburn	66	9 to 0	18448
Uneven-aged selection cut	6	3 to 0.42	3171
Grand Total	249	10 to 0	64549

Conclusions

In summary, this analysis of cumulative effects to the fisher for the Kings River Project reveals the following key points:

- The amount of suitable fisher habitat on the High Sierra Ranger District and in the KRP area over the last ten years is stable or slightly increasing. Looking more closely at this, we see that a greater proportion of resting/denning habitat may benefit over the next 10-20 years from treatments proposed in the Proposed Action or Reduce Harvest Tree Size alternatives compared to foraging habitat (Tables CE2 and CE3). This is important because, when compared to foraging habitat, resting/denning habitat is generally considered the most limiting habitat component for fisher across the landscape. At the larger landscape scale of the SSFCA, the Sierra NF currently contains 57% of the 844,776 acres of suitable

fisher habitat in the SSFCA (as defined by Freel (1992)); treatments under the Proposed Action or the Reduce Harvest Tree Size alternatives would result in a loss of suitable fisher habitat totaling approximately 0.10% of the total available within the entire SSFCA (Tables CE2 and CE3). Full recovery of reproductive habitat is expected within 10-20 years.

- There is preliminary evidence of a stable fisher population in the KRP. However, within the Southern Sierra Fisher Conservation Area, fisher in the KRP area may be more sensitive to treatments than on the Sequoia National Forest because fisher are present in lower population densities.
- The U.S. Dept. of Interior's Fish and Wildlife Service (2005 and 2006c) has reviewed the proposed Saddle Fuels Reduction Project on the Sequoia National Forest and the proposed action for the Kings River Project. In both instances, they provided conservation recommendations and reached the following conclusions with respect to fisher:

    - Saddle Fuels Reduction Project was not likely to result in adverse effects to the fisher (U.S. Dept of Interior 2005)
    - Kings River Project is likely to affect fishers but the identified protection measures (listed at the beginning of the Direct and Indirect Effects section of the BE for fisher) would reduce those effects (U.S. Dept of Interior 2006c).

  The U.S. Dept of Interior (2006c) further notes that the federal status of and threats to the fisher will be re-examined annually (in the most recent 2005 status review, the threats to the fisher were "evaluated as of high magnitude but as non-imminent … based on the observation that numbers of fishers in occupied habitat appear to be stable or not rapidly declining"). As has been noted by other researchers, the U.S. Dept of Interior (2006c) states that the threats of most importance to fisher involve conservation issues relating to small isolated populations and the potential that further loss and fragmentation of habitat may occur. These concerns are most applicable to management units glen_mdw_1, krew_bul_1, or n_soapro_2, which exhibit a scarcity of high quality suitable habitat or a greater degree of suitable habitat fragmentation than the other management units within the Kings River Project analysis area. To address this, the Old Forest Linkages are designed to maintain habitat corridors and provide refugia containing the highest quality of habitat, thereby allowing fisher to move through the Kings River Project area to other points north or south. The entire foregoing spatial and temporal analysis has taken habitat connectivity into account and disclosed the potential risks of the short-term impacts to fisher and its habitat, as well as the long-term benefits to fisher resulting from a greater number of large trees and denser canopy across the landscape concomitant with a reduction of the risk of stand-replacement wildfire.
- A number of project activities have been implemented within the boundary of the SSFCA in the recent past that have the potential to disturb fisher or remove/modify its habitat. Fisher appear capable of returning to disturbed areas, and are detected at different times following disturbance. However, historically, wildfire plays a more dominant role in affecting the quantity, quality, and distribution of fisher habitat; for the indefinite future, that trend is expected to continue. Given the impacts to habitat over the past 100 years, the gap in the

fisher population between the southern Sierra and northern California, and the lower estimates for quality of habitat and fisher population density on the Sierra Forest compared to the Sequoia Forest, implementation of the Kings River Project undoubtedly poses an unknown risk to fisher that inhabit the area. However, one of the challenges in assessing the effects of fire management of fisher habitat is the need to weigh the long-term benefits of the reduction of risk of catastrophic fires against any potential short-term effects on the quality or quantity of fisher habitat (see, for example, the U.S. Fish and Wildlife Service letter that evaluates the net benefits of hazardous fuels treatment projects (U.S. Dept of Interior 2002)). Both action alternatives, especially the Reduce Harvest Tree Size alternative, have the potential to improve fisher habitat in the long term. Based on the body of evidence before us, and until further information is presented, proceeding with either the Proposed Action or the Reduce Harvest Tree Size alternative ***under an adaptive management approach*** is currently the best option we can take. Within the scale of recent past land management activities, implementation of the initial eight management units would not preclude future management options for the fisher or result in a loss of viability of fisher populations on the Sierra NF. Moreover, under the adaptive management approach described in the proposed action, future management activities within the KRP would be informed by the results of monitoring and research tied to the initial eight management units.

As a result, the cumulative effects of vegetation management activities in the KRP initial eight management units taken together with past, present, and reasonably foreseeable activities on the Forest and across the SSFCA will not result in a loss of viability for the fisher.

Marten, FSS and MIS; Wolverine, FSS; and Sierra Nevada Red Fox, FSS

In the initial eight management units, only one of these species (marten) has been sighted in one unit (KREW_prv_1). It is unlikely these mesocarnivores den in these units due to the elevation range of the species. If they are foraging or resting in one of these units, when trees are being removed with mechanical equipment (tractor, masticator, etc.) there may be a direct effect due to the noise disturbance involved with project activities. Short term disturbance may occur to their behavior patterns from prescribed fire because these animals may leave the area due to smoke or noise disturbance associated with the activities.

Evaluative Criteria for Martin and Summary of Direct Effects

The following criteria are similar to fisher, however, they have been modified where it is applicable for the marten. (They are not applicable to the wolverine and Sierra Nevada red fox because there is minimal suitable habitat identified in the initial eight management units.)

- Canopy cover across the landscape
    - Under alt 3, the long term goal is to develop or maintain 50% of the landscape outside of WUI with canopy density >60%

  - Under alt 1, the long term goal it to develop or maintain 50% of the are of potential fisher habitat in CWHR class 4 or higher with 50% canopy cover or greater
- Protection of stand-level habitat components and individual rest structures important to fisher (e.g., large diameter snags and oaks, patches of dense large trees, and coarse woody debris)

  - Protect important habitat structures such as large diameter snags and oaks, patches of dense large trees (typically ¼ to 2 acres), large trees with cavities for nesting, and coarse woody material; use firing patterns and place fire lines around snags and large logs to minimize effects of underburning. The "Fisher and Priority Sites Marking Guide – Kings River Project" will be used to identify the most suitable individual trees and groups of trees for retention. (Alt 3).

- **Establishment of a system of travel corridors or "old forest linkages" (OFL)**
  - A system of old forest linkages have been created along perennial steams and including 300' of adjacent habitat with 50-60% canopy cover on each side of the streams.
- **Effects of stand-replacement fire**
  - By implementing Alt 1 it will reduce the effects of stand-replacement fire with some large trees. If Alt 3 is implemented it will be the same outcome with a few larger trees not removed in treatment.

Indirect Effects to Marten

While the effects to the marten will be similar to those described for the fisher, they will also be smaller in scale since some elevations within the project area are below the elevations where marten are usually found. Elevations above the KRP area could also serve as potential refugia for marten. Prey species may leave the areas of disturbance or use underground tunnels, depending on the small mammal. It is assumed the prey species would move back into the area after underburning has been completed.

Cumulative Effects to Marten

The area considered in determining the cumulative effects of past, present, and reasonably foreseeable activities on marten encompasses the Sierra NF. This is an appropriate scale for cumulative effects for a wide-ranging species (such as the marten) that has also been selected as a Management Indicator Species for the Sierra NF. Based on the following analysis, a determination of viability for the marten will be made.

The pre-project quantity of suitable marten resting/denning habitat in the Sierra NF is 319,000 acres, and 2,556 of those are located within the KRP area. There are an additional 41,500 acres of suitable marten foraging habitat in the Sierra NF, 57 of which are in the KRP area. Additional pre- and post-project marten habitat data can be found in following tables.

Suitable marten resting/denning habitat in the KRP area before, immediately after, 10 years after, and 20 years after implementation of alternatives.

Marten		Acres of Suitable Resting/Denning Habitat Definition: CWHR 4D, 4M, 5D, 5M, elevation 6000 – 10,000 ft					
Scale	Alternative	Pre-project	Post-project	Year 10		Year 20	
				Without Fire	With Fire	Without Fire	With Fire
Kings River Project	Proposed Action	2556	2222	2329	1680	2423	1909
	No Action		2556	2710	552	2802	567
	Reduced Harvest Tree Size		2236	2644	1700	2670	1924

Suitable marten foraging habitat (in addition to resting/denning habitat) in the KRP area before, immediately after, 10 years after, and 20 years after implementation of alternatives.

Marten		Acres of Suitable Foraging Habitat Definition: CWHR 3D, 3M, elevation 6000 – 10,000 ft					
Scale	Alternative	Pre-project	Post-project	Year 10		Year 20	
				Without Fire	With Fire	Without Fire	With Fire
Kings River Project	Proposed Action	57	50	25	4	73	1
	No Action		57	68	0	119	0
	Reduced Harvest Tree Size		50	25	4	73	1

Data from the SNFPA (USDA 2001c) indicate that CWHR habitat stages 4M, 4D, 5M, 5D, and 6 are moderately to highly important for the marten. The identified habitat risk factors for this species include: (1) removal of overhead cover, large diameter trees, and coarse woody debris, (2) conversion of xeric to mesic sites, (3) grazing, and (4) fire suppression.

Martens typically have a large home range size for such a small carnivore, averaging about 1 mi^2 (males average 807 acres, or 1.26 mi^2, and females average 254 acres, or 0.40 mi^2; USDA 2001c, Dr. W. J. Zielinski, pers. comm., 8 Sept 2006). Additionally, Dr. W. J. Zielinski (pers. comm., 8 Sept 2006) stated that the average elevation at which martens are found in the southern Sierra Nevada is 6900 feet. As a result, if martens reside in the KRP area, they are likely meeting their denning, resting, and foraging needs there. Elevations above the KRP area could also serve as potential refugia for the species, because their preferred elevational range extends to 10,000 feet or higher. Despite requiring such large home ranges, the marten remains well-distributed throughout its current range in the southern Sierra Nevada (Zielinski *et al.* 2005), which continues to resemble its historical range.

In addition to the previously mentioned habitat risk factors, there are two important non-habitat risk factors for martens: (1) development and (2) climate change. Climate change is beyond the scope for this analysis and areas of large-scale development are not planned

for the Kings River Project area. Changes in vegetation composition and structure at a scale larger than the Kings River Project area are summarized below.

Biological Evaluations for many of the past projects in the Sierra NF were reviewed to help inform the present analysis. Our review of these documents revealed the following basic information about effects to marten from these activities:

- Twenty-six (26) total project Biological Evaluations (BEs) were reviewed, dating back to 1993 on the Sierra NF.
- Determinations reached were:
    - No effect – 7 BEs
    - May affect individual marten, but not likely to lead to a trend toward federal listing or loss of viability – 15 BEs
    - May affect individual marten, and likely to lead to a trend toward federal listing or loss of viability – 0 BEs
    - Marten were not addressed in the document we reviewed due to lack of habitat or other reasons – 4 BEs
- Types of Projects: Fuels reduction, harvest, hazard tree removal, and thinning were the proposed activities that were most often represented in the sample of BEs in which the marten was analyzed.
- Relative to "May Affect" projects, the described impacts to marten most often fell in the following categories:
    - Temporary disturbances
    - Foraging area may be burned if underburning gets out of control
    - Removed hazard trees could serve as resting or denning sites
    - Habitat altered or removed
    - Reduction of habitat quality (e.g., reduction in canopy cover)
    - Habitat will be entered
    - Noise disturbance

Additional past, present, and reasonably foreseeable future activities are outlined at the beginning of Chapter 3 of the Kings River FEIS. Many of these activities were judged to have no effect on the marten because the project(s) were taking place below 6000 ft elevation. Some of the roadside hazard tree removal and recreation activities may cause disturbance to marten that may be in the area.

A review of the fire history dating back to 1916: Marten habitat has been exposed to and affected by fire to a similar extent as that of fisher habitat. For a detailed discussion, please refer to the section entitled "**A review of the fire history dating back to 1916**" within the fisher cumulative effects section.

A review of how past activities since about the mid 1960s have affected the landscape: As with fire, past activities since the mid-1960s have affected marten habitat in much the same way as fisher habitat. For a detailed discussion of these effects, please see the section entitled "**A review of how past activities since about the mid 1960s have affected the landscape**" within the fisher cumulative effects section.

An analysis of how timber harvest since 1978 has affected fisher habitat: Because marten and fisher use similar habitats, please refer to the section entitled "An analysis of how timber harvest since 1978 has affected fisher habitat" within the fisher cumulative effects section.

Given the marten's continued occupancy of a range similar to its historical distribution, the small percentage of suitable habitat being affected (compared to what is available on the Forest), the long-term objective for increasing the number of large trees across the

landscape, the intention of reducing fuels, and the discussion of cumulative effects, the Kings River Project, although it is not without risk, is not likely to result in a loss of viability for the marten.

Direct, Indirect and Cumulative Effects to Wolverine

In the southern Sierra Nevada, wolverines are typically found at elevations above 8,000 feet[13] (Dr. W. J. Zielinski, pers. comm., 8 Sept 2006 and California Department of Fish and Game (2005:M159)), which exceeds elevations of all initial eight management units except a small part of KREW BUL. Additionally, Dr. W. J. Zielinski (pers. comm., 8 Sept 2006) stated that the chances of wolverine presence in the project area are low to non-existent, based on PSW surveys in the area from 1996 – 2002. Moreover, no corroborated wolverine sightings have occurred in California in over 50 years.

The area considered in determining the cumulative effects of past, present, and reasonably foreseeable activities on wolverines encompasses the Kings River Project (KRP) area and includes the entire Sierra National Forest (NF). Based on the following analysis, a determination of viability for the wolverine will be made.

Within the Sierra NF, there are 319,000 acres of habitat suitable to wolverines (i.e., CWHR 4D, 4M, 5D, 5M; elevation 6,000 – 10,800 feet), and the KRP area contains 2,556 such acres. Following implementation of each of the alternatives, acreage of suitable wolverine habitat in the KRP area is illustrated in following table.

Suitable wolverine habitat in the KRP area before, immediately after, 10 years after, and 20 years after implementation of alternatives.

Wolverine		Acres of Suitable Habitat (4D, 4M, 5D, 5M; elevation 6,000 – 10,800 feet)					
Scale	Alternative	Pre-project	Post-project	Year 10		Year 20	
				Without Fire	With Fire	Without Fire	With Fire
Kings River Project	Proposed Action	2,556	2,222	2,329	1,680	2,423	1,909
	No Action		2,556	2,710	552	2,802	567
	Reduce Harvest Tree Size		2,236	2,644	1,700	2,670	1,924

Biological Evaluations for many of the past projects in the Sierra NF were reviewed to help inform the present analysis. Our review of these documents revealed the following basic information about effects to wolverines from these activities:

- Twenty-six (26) total project Biological Evaluations (BEs) were reviewed, dating back to 1993 on the Sierra NF.
- Determinations reached were:
    - No effect – 5 BEs
    - May affect individual wolverines, but not likely to lead to a trend toward federal listing or loss of viability – 3 BEs

[13] Range = 5,000 - 6,400 ft to 10,800 - 13,000 ft

  - May affect individual wolverines, and likely to lead to a trend toward federal listing or loss of viability – 0 BEs
  - Wolverine was not addressed in the document we reviewed due to lack of habitat or other reasons – 18 BEs
- Types of Projects: Hazard tree removal and underburning were the proposed activities that were most often represented in the sample of BEs in which the wolverine was analyzed.
- Relative to "May Affect" projects, the described impacts to wolverines most often fell in the following categories:
  - Noise disturbance
  - Habitat alteration

Additional past, present, and reasonably foreseeable future activities are outlined at the beginning of Chapter 3 of the Kings River FEIS. Of those activities outlined in Chapter 3, most made a "No Effect" determination for the wolverine because the project occurred below 6,000 feet in elevation. None of the "May Affect" activities quantified the impacts on wolverines. Due to the nature of the proposed activities, the Kings River Project would not contribute to an increase in snowmobile or hiker use of the backcountry, which are recreational activities that could pose risks to wolverine populations in the Sierra Nevada (USDA 2001c).

As a result, the cumulative effects of vegetation management activities in the KRP initial eight management units taken together with past, present, and reasonably foreseeable activities on the Forest will not result in a loss of viability for the wolverine.

Direct, Indirect and Cumulative Effects to Sierra Nevada Red Fox

In the Sierra Nevada, this species is typically found at elevations above 7,000 feet[14] (Dr. W.J. Zielinski, pers. comm., 8 Sept 2006 and California Department of Fish and Game (2005:M147)), which exceeds elevations of all initial eight management units except KREW BUL. Additionally, Dr. W. J. Zielinski (pers. comm., 8 Sept 2006) stated that PSW survey data from 1996 – 2002 appear to support the conclusion that the Lassen National Park is the last holdout for the Sierra Nevada red fox. Furthermore, Zielinski stated there is no recent evidence of Sierra Nevada red foxes within several hundred miles of the KRP area.

The area considered in determining the cumulative effects of past, present, and reasonably foreseeable activities on Sierra Nevada red foxes encompasses the KRP area and includes the entire Sierra NF. Based on the following analysis, a determination of viability for the Sierra Nevada red fox will be made.

Within the Sierra NF, there are 41,000 acres of suitable habitat for Sierra Nevada red foxes (i.e., CWHR 4M lodgepole pine/red fir; elevation 5,000 – 9,700 feet), and the initial eight management units contain 54 such acres. Following implementation of the alternatives, the acreage of suitable Sierra Nevada red fox habitat in the KRP area will remain unchanged for at least 20 years.

[14] Range = 3,900 - 4,500 ft to 11,500 - 11,900 ft

Biological Evaluations for many of the past projects in the Sierra NF were reviewed to help inform the present analysis. Our review of these documents revealed the following basic information about effects to foxes from these activities:

- Twenty-six (26) total project Biological Evaluations (BEs) were reviewed, dating back to 1993 on the Sierra NF.
- Determinations reached were:
    - No effect – 11 BEs
    - May affect individual foxes, but not likely to lead to a trend toward federal listing or loss of viability – 6 BEs
    - May affect individual foxes, and likely to lead to a trend toward federal listing or loss of viability – 0 BEs
    - Sierra Nevada red fox was not addressed in the document we reviewed due to lack of habitat or other reasons – 9 BEs
- Types of Projects: Hazard tree removal, thinning, and underburning were the proposed activities that were most often represented in the sample of BEs in which the red fox was analyzed.
- Relative to "May Affect" projects, the described impacts to red foxes most often fell in the following category:
    - Reduction of habitat quality

Additional past, present, and reasonably foreseeable future activities are outlined at the beginning of Chapter 3 of the Kings River FEIS. As with the wolverine, many of the activities outlined in Chapter 3 were determined to have no effect on foxes because the proposed activities occurred below 6,000 feet in elevation. Additionally, none of the "May Affect" activities, with respect to foxes, quantified the potential impact on Sierra Nevada red foxes. Due to the nature of the proposed activities, the Kings River Project would not contribute to an increase in snowmobile or hiker use of the backcountry, which are recreational activities that could pose risks to Sierra Nevada red fox populations in the Sierra Nevada (USDA 2001c).

As a result, the cumulative effects of vegetation management activities in the KRP initial eight management units taken together with past, present, and reasonably foreseeable activities on the Forest will not result in a loss of viability for the Sierra Nevada red fox.

Pallid Bat, FSS

Direct and Indirect Effects

The Pallid bat tends to be a roosting habitat generalist that utilized many different natural and manmade structures. Foraging requirements appear to be more restrictive. Pallid bats appear to be more prevalent within edges, open stands, particularly hardwoods, and open areas without trees. The reduction of hardwoods, both from manual removal and competition from conifers, reduces foraging habitat for pallid bats. The hardwoods will be protected within the initial eight management units; therefore, there should be a beneficial effect to the species (SNFPA, Part 4.4).

Pallid bats may roost in tree hollows, which may be burned when the underburning occurs. Bats could leave the area due to smoke from underburning. As stated above, literature shows that they utilize snags. They may leave the area when logging occurs due to noise disturbance.

Cumulative Effects to Pallid Bat

The area considered in determining the cumulative effects of past, present, and reasonably foreseeable activities on pallid bats encompasses the Sierra NF. Based on the following analysis, a determination of viability for the bat will be made.

Biological Evaluations for many of the past projects in the Sierra NF were reviewed to help inform the present analysis. Our review of these documents revealed the following basic information about effects to pallid bats from these activities:

- Twenty-six (26) total project Biological Evaluations (BEs) were reviewed, dating back to 1993 on the Sierra NF.
- Determinations reached were:
    - No effect – 4 BEs
    - May affect individual bats, but not likely to lead to a trend toward federal listing or loss of viability – 10 BEs
    - May affect individual bats, and likely to lead to a trend toward federal listing or loss of viability – 0 BEs
    - Pallid bat was not addressed in the document we reviewed due to lack of habitat or other reasons – 12 BEs
- Types of Projects: Fuels reduction, hazard tree removal, thinning, and underburning were the proposed activities that were most often represented in the sample of BEs in which the pallid bat was analyzed.
- Relative to "May Affect" projects, the described impacts to pallid bats most often fell in the following categories:
    - Loss of roosting trees/snags
    - Displacement because of smoke from underburning
    - Noise disturbance
    - Two KRP-scale projects reduced canopy cover on a total of 210 acres

Additional past, present, and reasonably foreseeable future activities are outlined at the beginning of Chapter 3 of the Kings River FEIS. Two projects mentioned in Chapter 3 would result in a 210-acre reduction in canopy cover at the KRP level: (1) Jose 1 project (60 acres converted from 4M to 4P and 8 acres converted from 3M to 3P), and (2) South of Shaver Project (122 acres converted from 4M to 4P and 20 acres converted from 4D to 4M).

Several risk factors were identified for pallid bats in the SNFPA (USDA 2001c): (1) removal of hardwoods and subsequent reduction in foraging habitat, (2) thick understory vegetation between the ground and eight feet in height, (3) prey reduction resulting from heavy grazing, (4) renewed exploration or closure of mines, (5) recreational caving, and (6) loss of tree roosts. Relative to risk factor #2 (thick understory vegetation), the cool burns and mechanical removal of small trees and brush that would result from implementation of the Proposed Action or Reduce Harvest Tree Size alternatives would benefit the pallid bat by thinning the understory that occurs within eight feet of the ground (Mark Smith, pers. comm., 22 Sept 2006).

Pallid bats occur most frequently below 6,000 feet and are especially sensitive to the removal of hardwoods (USDA 2001c). Except for 4D and 5D, CWHR rates all size classes and densities in blue oak woodlands as High for pallid bat, in terms of meeting its foraging needs. Montane hardwood conifer and montane hardwood habitats are rated

Low for pallid bat by CWHR (California Department of Fish and Game 2005). Currently, there are 32,600 acres of blue oak woodlands and 251,000 acres of montane hardwoods and montane hardwood conifers below 8,000 ft on the Sierra NF in CWHR size classes 2 and higher; 2,732 acres of that total are within the initial eight management units of the KRP area. The protection, maintenance, and enhancement of such westside foothill oaks and montane oaks are expected to benefit pallid bats by ensuring the continued availability of roosting sites. Indeed, all alternatives proposed in the SNFPA would lead to an increase in oak species (USDA 2001c).
Three known night roosts for pallid bats exist on the Sierra NF, and they are at the following locations: (1) Million Dollar Mile Road, (2) under the bridge that crosses Highway 168, before the Rancheria Bridge, and (3) on the Kings River Ranger District. To date, the Million Dollar Mile roost can only be entered via a locked gate, to which Southern California Edison (SCE) employees have sole access. There are no protection measures on the two additional roost sites because they are located along public access routes through the Forest. With respect to human recreation pressure on these sites, the only pressure has come, and in the foreseeable future will continue to come, from forest visitors in their personal vehicles.

Cumulative effects discussed in the SNFPA stated that there have been no recent changes in the range or distribution of the pallid bat (USDA 2001c). For these reasons, and given the long-term objective for increasing the number of large trees across the landscape, the intention of reducing fuels, and the foregoing discussion of effects, the cumulative effects of vegetation management activities in the KRP initial eight management units taken together with past, present, and reasonably foreseeable activities on the Forest will not result in a loss of viability for the pallid bat.

Townsend's Big-eared Bat

Direct and Indirect Effects

The distribution of the species is patchy and associated with limestone caves, lava tubes, and man-made structures, such as mines and abandoned buildings. Given the requirement of a specific environment and this bat's sedentary behavior, it is likely that Townsend's big-eared bat is limited by roost site availability. Although natural deterioration of caves and mines is expected, the majority of roost loss is related to human activity in the form of disturbance, demolition, renewed mining, hazard abatement, or vandalism (SNFPA Part 4.4). There will be no direct or indirect effects to the species because treatments will not occur in their habitat of caves, mines or other areas mentioned above.

Cumulative Effects to Townsend's Big-eared Bat

Although not much is known about the Townsend's big-eared bat, projects are rarely implemented in its habitat. Gates have been installed to protect the caves and to provide suitable structures for bats to enter and exit known areas. The Townsend's big-eared bat is a relatively sedentary species. As a result, if appropriate foraging habitat is unavailable or inaccessible then providing roosting habitat may not be adequate for complete conservation of this species. However, lack of spatial data prevents a thorough analysis of foraging habitat (USDA 2001c). At a larger scale, there is no indication that there have

been reductions in the Townsend's big-eared bat's historic range or in the habitat upon which this species depends. Hardwood habitat throughout this species' range is declining but to what extent this is affecting the species is uncertain. Fluctuations in the development and use of mines and caves have been reported (USDA 2001c). Because there will be no direct or indirect effects resulting from implementation of the proposed action, there will be no cumulative effects to Townsend's big-eared bat and therefore viability for this species will not be affected by the Kings River Project.

Management Indicator Species Habitat and/or Population Information and Effects of the Alternatives on those Species that are Not Sensitive

Mule Deer, MIS

Habitat-Species Relationships and Forest Habitat and Population Data

Mule deer are thought to occupy about 64 million acres of habitat in California. Of that total, estimates of the amount of suitable habitat in the Sierra Nevada range from 2,262,890 acres (SNFPA 2001) to over 11 million acres as calculated by summing High and Moderate CWHR habitat capability types for this species. The CWHR High and Moderate habitat estimate for the Sierra National Forest is currently 493,000 acres.

Quantity of habitat on the Sierra National Forest has decreased by about 70,000 acres between 1996 and 2006 (USDA Forest Service 2006). The population of mule deer in California and in the Sierra Nevada has been described as “demonstrably widespread, abundant, and secure” (NatureServe 2005). Within Hunt Zone D-6, 39.4% of which is comprised of Forest Service lands from the Stanislaus and Sierra National Forests, the California Department of Fish and Game estimated the population of mule deer to be 24,600 individuals in 2002 (CDFG 2003). Similarly, the population trend for Deer Assessment Units 5 and 6, which include lands on the Sierra National Forest, has been described as Increasing and Stable, respectively. The Sierra National Forest reports that monitoring of the Yosemite Deer Herd during the 2001 – 2004 period shows a slight downward population trend (USDA Forest Service 2006). These population data gathered from the Sierra NF and other areas in the Sierra Nevada for the Deer Assessment Units and Deer Herds present on the Sierra NF indicate a stable or secure Forest-wide population trend.

For more detailed information on habitat-species relationships and forest habitat and population data, see the Management Indicator Species Specialist Report – Kings River Project (Robinson 2006).

Direct, Indirect, and Cumulative Effects of the Proposed Action

The North Kings Deer Herd Segment is located on the western slopes of the Sierra Nevada Mountains in Fresno County. In the LRMP, important habitat types for deer were described and specific areas were identified where management for these habitat types is emphasized. Each type has standards and guidelines in the LRMP for management and they are incorporated into stand prescriptions where they occur in the initial eight

management units. The specific areas that occur in the initial eight management units are listed in the following table.

Deer habitat types found in the project area, displayed by management unit.

Management Unit	Holding Area	Migration Corridors	Population Center	Winter Range
Bear_fen_6	Oak Flat (#12)	Yes	No	No
El_O_Win	Big Fir-Dinkey-Lower Dinkey (#11)	Yes	Dinkey (#13)	No
Glen_Meadow_1	No	Yes	No	No
KREW_Bul_1	No	Yes	No	No
KREW_Prv_1	Summit (#9); Blue Canyon – Providence (#10)	Yes	No	No
N_Soapro_2	No	No	No	Secata-Cottonwood (#6)
Providen_1	Summit (#9)	Yes	No	No
Providen_4	No	No	No	Secata-Cottonwood (#6)

With the application of the LRMP standards and guidelines, direct and indirect effects to deer will be minimal because the most important habitat types to deer will receive the management emphasis called for in the LRMP and the KRP uneven-aged silvicultural treatments and prescribed burning will tend to improve deer foraging habitat.

The cumulative effects are considered at the scale of the KRP project area and extended to the entire Sierra National Forest. Outside of the initial eight management units but within the rest of the KRP, there is substantial summer range at higher elevations and winter range at lower elevations. The KRP encompasses most of the range of the North Kings Deer Herd Segment and the deer move with the seasons over this large area of the forest. To determine cumulative effects to deer, the activities described at the beginning of Chapter 3 of the FEIS (e.g., plantation maintenance and thinning, fuels reduction and underburn projects, hazard tree removal, and uneven-aged management on private land) were considered. These management activities will affect no less than 24,000 acres and some loss of suitable habitat in selected areas is to be expected. However, considered together with those activities proposed in the initial eight management units and possible future treatments in the KRP, these predominantly uneven-aged management activities are expected to have a beneficial cumulative impact to deer by providing the openings and vegetation/structural diversity needed for deer foraging habitat.

Project Impacts to MIS Population Attributes or Trends at the Forest Scale

The Kings River Project will affect 10,250 acres of deer habitat, which is 2% of the 493,000 acres of deer habitat on the Sierra NF and equivalent to about 21 deer home ranges (assumes an average home range size is 480 acres or 0.75 mi^2, as reported by the

California Department of Fish and Game (2005:M181)). Given the proportionately small quantity of habitat affected and the expectation that many impacts will be beneficial to deer, the direct, indirect, and cumulative effects of the alternatives are not expected to change the current Forest scale habitat or population trends of mule deer on the Sierra National Forest.

Riparian Avian Species, MIS

Habitat-Species Relationships and Forest Habitat and Population Data

The Warbling Vireo (WAVI), White-crowned Sparrow (WCSP), Wilson's Warbler (WIWA), and Yellow Warbler (YWAR) were selected to represent a range of meadow edge / riparian habitat types. WAVI is a fairly common to common, summer resident throughout much of California, but occurs only as a spring and fall migrant in the southern interior and Central Valley (CWHR 2005). WCSP is common-to-abundant year-round in California, breeding in higher mountains, and in the humid coastal strip south to Santa Barbara County; it is widespread from October to April throughout most of state, below heavy snows (CHWR 2005). WIWA is a common migrant and summer visitor the length of California (CWHR 2005). The Yellow Warbler (YWAR) breeds from northern Alaska across northern Canada to Labrador, south to Panama and through West Indies to northern coast of South America, and winters in southern California, southern Arizona, northern Mexico, and southern Florida south to central Peru, northern Bolivia, and Amazonian Brazil (NatureServe 2005). In California, the YWAR breeds from the coast range in Del Norte county, east to Modoc plateau, south along the coast range to Santa Barbara and Ventura counties and along the western slope of the Sierra Nevada south to Kern county; it also breeds along the eastern side of California, from the Lake Tahoe area south through Inyo County and in several southern California mountain ranges and throughout most of San Diego County (CWHR 2005).

Management concerns applicable to these species include cowbird parasitism and habitat degradation resulting from grazing.

Population trend information reported below for these species is derived from the BBS data analyzed at a variety of scales. For more information about the BBS data and how they have been applied to this report, please see USDA Forest Service (2006).

The current estimate of suitable habitat for the WIWA and WAVI is 181,000 acres (USDA Forest Service 2006). These acres were computed by summing the acres of CWHR habitat types extending out 200 meters from perennial streams, lakes, and meadows into the surrounding forest across the Sierra NF. YWAR and WCSP utilize habitat within about 35 meters of streams or small meadows and openings (3acres or greater). Resolution of small meadows and openings is poor on the Sierra NF Vegetation GIS Coverages so it was not possible to calculate the current acreage of habitat for these species.

Population trend data for each of these species is shown in the following table and is adapted from information in the Sierra National Forest MIS Report (USDA Forest Service 2006). At a statewide scale, each of these four species has a negative population trend. Within the Sierra Nevada, population trend data are less certain, though with the exception of WAVI, all still appear to be declining. Population trends for these species at the North American scale of the entire BBS range from Definitely Decreasing (Wilson's Warbler) to Definitely Increasing (Warbling Vireo). With population trend data suggesting these species to be declining in California, and the Sierra Nevada representing a significant portion of their range in the state, the habitat needs of these species should be a priority of land managers here.

Population trends for riparian avian species, as computed from BBS data for the 1966-2004 survey.

	Population Trend Summary For Riparian Avian Species		
Species Name	Sierra Nevada	California	Survey-Wide
Warbling Vireo	Definitely Stable	Definitely Decreasing	Definitely Increasing
White-crowned Sparrow	Possibly Decreasing	Definitely Decreasing	Likely Decreasing
Wilson's Warbler	Likely Decreasing	Definitely Decreasing	Definitely Decreasing
Yellow Warbler	Possibly Decreasing	Possibly Decreasing	Definitely Stable

At the Forest scale, the Warbling Vireo is monitored on eight of nine BBS routes with an average population trend estimate of 7.25% per year; the White-crowned Sparrow is monitored on three of nine BBS routes; the Wilson's Warbler and Yellow Warbler are monitored on seven of nine BBS routes (Appendix 1mis). Average population trend estimates for the latter three species are stable. All Forest-level average population trend estimates provided here only utilized the LOESS trend estimator (Appendix 1mis). Purcell (2006) found that WAVIs were most abundant at mid-elevation mixed conifer forests on the Sierra NF. Mixed conifer habitat also had the highest rates of nest success, followed by ponderosa pine and true fir.

For more detailed information on habitat-species relationships and forest habitat and population data, see the Management Indicator Species Specialist Report – Kings River Project (Robinson 2006).

Direct, Indirect, and Cumulative Effects of the Proposed Action

The proposed activities (Alternatives 1 and 3) will begin implementation of a landscape level program of uneven-aged silviculture and prescribed fire on over 9,000 acres within the approximate 13,700-acre project area. Specifically, 9,751 acres are planned for mechanical treatments using a combination of methods (e.g., helicopter, tractor bunch, etc.). Herbicides (glyphosate) will be applied to 1,183 acres, and prescribed burning would occur on over 9,000 acres. During implementation of these treatments, project design measures and best management practices that were incorporated into the proposed action include (but are not limited to) the following:

- Follow all applicable aquatic wildlife species and riparian habitat standards and guidelines from the 2004 Sierra Nevada Forest Plan Amendment (USDA 2004a), the existing Sierra National Forest LRMP direction (USDA 1992), FSH 2509.22 Sierra Supplement #1 for treatments within stream management zones (USDA 1990), Best Management Practices and other applicable laws and regulations.
- Riparian Conservation Areas include a protected area of 300 feet on either side of perennial streams, measured from the bank full edge of the stream.
- Within Riparian Conservation Areas, no mechanical equipment is allowed within 100 feet of meadows or other special aquatic features and a no streambank trees are cut.
- Within Riparian Conservation Areas, reduce as much as possible ground disturbing impacts
- Special protection measures for California red-legged frogs, Western pond turtle, and relictual slender salamander
- A number of Best Management Practices, including Streamside Management Zone designation, meadow protection, streamcourse and aquatic protection, consideration of water quality in formulating fire prescriptions, protection of water quality from prescribed fire effects, protection of wetlands (ground-disturbing activities are not allowed in wetlands or meadows)
- Do not remove or otherwise alter existing riparian vegetation

These project design measures will substantially minimize (although by no means completely eliminate) impacts to fish and wildlife species dependent on riparian and meadow habitats. This is especially true for individuals of riparian- or meadow-dependent species whose breeding and/or foraging areas extend beyond the protection zones described above. In large part, however, treatments will be kept out of meadows and the immediate riparian habitats. Exceptions to the above project design measures occur and were made to accommodate the Kings River Experimental Watershed Study in the krew_bul_1 and krew_prv_1 management units, as described in the Project Design Measures listed in Chapter 2. Noise from the operation of equipment adjacent to riparian areas may cause intermittent or periodic disturbance to species in these habitats. Birds tend to temporarily move away from noise-generating activities; however, the full effects of noise disturbance are not known and are certainly expected to vary between species. Depending on the timing and location of the proposed activities, nests of some individuals may be disturbed or destroyed. The proposed actions do not increase the amount of grazing activity in the planning area and are therefore not expected to have any measurable impact on cowbird parasitism rates or grazing pressures that may be affecting the target species (WIWA, WCSP, WAVI, and YWAR).

The Best Management Practices and some of the specific KRP project design measures listed above may also apply to the activities described at the beginning of Chapter 3 (e.g., plantation maintenance and thinning, fuels reduction and underburn projects, and hazard tree removal). Considering these other ongoing or reasonably foreseeable actions planned for the KRP project area, the cumulative effects of implementing the proposed activities (Alternatives 1 or 3) is the temporary displacement of wildlife species from meadows or riparian areas due to noise disturbance and the impacts to riparian- or meadow-dependent

species whose breeding or foraging areas extend beyond the protection zones created by the project design measures. Such effects are, however, ameliorated by the broad protection extended to riparian and meadow habitats via the project design measures and Best Management Practices described above.

Alternative 2 (the No Action alternative) would have no impact on the riparian species or their habitat.

Project Impacts to MIS Population Attributes or Trends at the Forest Scale

Implementation of the proposed activities (Alternatives 1 or 3) may affect individual riparian- or meadow-dependent avian species but is not expected to have any measurable impact on the ability of these species to breed and reproduce in riparian and meadow habitats on the Sierra National Forest. Based on existing home range data for these species, ground-disturbing activities in riparian areas that are one to three acres in size may adversely affect one breeding pair; however, given the project design standards and Best Management Practices that are in place, such disturbances will not be common or widespread. Therefore, the direct, indirect, and cumulative effects of the alternatives are not expected to change the current Forest scale habitat or population trends for riparian avian species on the Sierra National Forest.

Oak Woodland Avian Species, MIS

Habitat-Species Relationships and Forest Habitat and Population Data

The Acorn Woodpecker (ACWO), Blue-gray Gnatcatcher (BGGN), and Oak Titmouse (OATI) were selected to represent a range of hardwood/oak woodland habitat types. The BGGN is an uncommon to common California summer resident in xeric, upland woodland and scrub habitats, especially with oaks (CWHR 2005). The OATI is a common resident in cismontane California, from the Mexican border to Humboldt County (CWHR 2005). ACWO is a common yearlong California resident, occurring in western Sierra Nevada foothills, Coast Ranges, Klamath Range, and locally on the eastern Sierra Nevada slope from Modoc to Nevada Counties (CWHR 2005).

The greatest threat facing these species in the Sierra Nevada is the widespread development of oak woodland habitats. Both OATI and ACWO are totally dependent on oaks, thus they are susceptible to any management practices that result in the loss or degradation of oaks and oak woodland habitat. Both of these species are cavity nesters thus they require snags and natural cavities in senescing oaks. Conversely, any project that results in the increase in oak habitat and oak vigor including increased mast production and oak regeneration should benefit these species. While BGGN are strongly correlated with oak woodland in the Sierra Nevada, they are not directly dependent on oaks (PRBO unpublished data). The key habitat attribute for this species in oak woodlands appears to be shrub understory (CalPIF 2002a, PRBO unpublished data). Fuel reductions that remove or inhibit shrub understory within oak woodlands may have a negative impact on this species. It should be noted that all three of these species are far

more abundant in blue oak (*Quercus douglasii*) woodlands in the Sierra Nevada than higher elevation black oak dominated woodlands (pers. comm., Ryan Burnett). On the Sierra NF, the blue oak woodland habitat usually does not extend much higher on the slope than about the 3000 ft elevation mark, where it is replaced by California black oak (*Quercus kelloggii*).

Over the past decade, acres of suitable habitat (i.e., oak woodlands, ponderosa pine) for the Acorn Woodpecker have increased across the forest from 300,000 to 326,000 acres (USDA Forest Service 2006). The prime habitat for the other species considered in this group of species typically occurs at elevations lower than those extant in the KRP area.

Population trend data for each of these species is shown in the following table and is adapted from information in the Sierra National Forest MIS Report (USDA Forest Service 2006). At a statewide scale, populations appear to be stable except for the Oak Titmouse, which is likely in decline. Within the Sierra Nevada, a decreasing tendency is evident for two of the three species, while the BGGN shows an increasing tendency. Population trends for these species at the North American scale of the entire BBS range from Likely Stable (Blue-gray Gnatcatcher and Acorn Woodpecker) to Likely Decreasing (Oak Titmouse).

Population trends for oak woodland avian species, as computed from BBS data for the 1966-2004 survey period.

	Population Trend Summary For Oak Woodland Avian Species		
Species Name	Sierra Nevada	California	Survey-Wide
Blue-gray Gnatcatcher	Increasing Tendency	Definitely Stable	Likely Stable
Oak Titmouse	Decreasing Tendency	Likely Decreasing	Likely Decreasing
Acorn Woodpecker	Decreasing Tendency	Likely Stable	Likely Stable

At the Forest scale, the Blue-gray Gnatcatcher is monitored on seven of nine BBS routes with an average population trend estimate of 3.2% per year; and the Oak Titmouse and Acorn Woodpecker are monitored on nine BBS route with average population trend estimates of –8.06% and –4.86% per year, respectively (Appendix 1mis). All Forest-level average population trend estimates provided here only utilized the LOESS trend estimator (Appendix 1mis). Between 1985 and 2006, additional monitoring data for these species have been collected at the San Joaquin Experimental Range on the Sierra National Forest in Madera County by Dr. Kathryn Purcell (K. Purcell, pers. comm., 22 Sept 2006).

For more detailed information on habitat-species relationships and forest habitat and population data, see the Management Indicator Species Specialist Report – Kings River Project (Robinson 2006).

Direct, Indirect, and Cumulative Effects of the Proposed Action

The proposed activities (Alternatives 1 and 3) will begin implementation of a landscape level program of uneven-aged silviculture and prescribed fire on over 9,000 acres within the approximate 13,700-acre project area. Specifically, 9,751 acres are planned for mechanical treatments using a combination of methods (e.g., helicopter, tractor bunch, etc.). Herbicides (glyphosate) will be applied to 1,183 acres, and prescribed burning would occur on over 9,000 acres. Of the eight management units included in the proposed action, only three of them contain appreciable quantities (e.g., between 100 and 700 acres each) of hardwood/oak woodland habitats: N_soapro_2, Providen_1, and Providen_4.

Currently, the dominant CWHR forest types across the initial eight management units are Ponderosa pine (28%) and Sierra mixed conifer (43%); montane hardwood (1,044 acres) and montane hardwood conifer (394 acres) make up only 8% and 3%, respectively, of the vegetation within the initial eight project area. Mixed chaparral and montane chaparral forest types currently total 890 acres, which is approximately 6% of the total habitat within the initial eight management units.

Implementation of the proposed activities (alternatives 1 or 3) would result in a slight decrease (about 55 acres) in trees in size classes 2 and 3 and about 108 more acres in size classes 4 and 5 (Tables 6mis, 7mis, and 8mis). These changes are small compared to the existing condition within the project area and the total of 4235 acres of oak woodland habitat within the approximate 72,000 acres of forested land comprising all 80 management units of the KRP (Tables 9mis and 10mis). Over the following ten years, considering all of the reasonably foreseeable and ongoing activities identified at the beginning of Chapter 3 of the FEIS, additional changes are expected; however, as shown above, the magnitude of these shifts is likely to be small compared to the total acres available. The loss of oak woodlands has been identified as a management concern for species dependent on this habitat. However, for the reasons stated here, the KRP is not expected to contribute to additional appreciable losses of oak woodland habitat.

Noise from the operation of equipment in or adjacent to oak woodlands may cause intermittent or periodic disturbance to species in these habitats. Birds tend to temporarily move away from noise-generating activities; however, the full effects of noise disturbance are not known and are certainly expected to vary between species. Depending on the timing and location of the proposed activities, nests of some individuals may be disturbed or destroyed. The proposed actions do not increase the amount of grazing activity in the planning area and are therefore not expected to have any measurable impact on cowbird parasitism rates or grazing pressures that may be affecting the BGGN.

The following design measure will apply throughout the KRP project area:

“Provide for oaks for wildlife needs, maintain the 5 to 35 percent of growing space devoted to oaks. Also, maintain all decadent oaks throughout the stand(s) within the limits appropriate for each forest type. Do not remove decadent oaks. Do not prevent over topping of decadent oaks.”

At the same time, the proposed activities meet the stated purpose and need of the KRP, which is to increase the number of large trees across the landscape and reduce tree density while increasing the proportion of shade intolerant species such as pine and black oak.

The No Action alternative would have no direct impact on the oak woodland species or their habitat, though with current fire suppression the continued encroachment of shade tolerant conifers would continue unabated resulting in further declines in the quantity and quality of black oak habitat with which these species may occur.

As noted above, the prime habitat for species such as the Acorn Woodpecker and Oak Titmouse is found in the blue oak woodlands, which typically occur at elevations lower than those in the KRP area. Indeed, no blue oak woodlands occur in the project area (initial eight management units), and only 66 acres of blue oak woodland are found across the entire set of the 80 KRP management units (Tables 9mis and 10mis). Because oaks in general are largely unaffected by the proposed activities (Alternative 1 or 3) and because oak woodland habitat in particular is generally absent from the planning area, the cumulative effects of implementing the proposed action are negligible.

Project Impacts to MIS Population Attributes or Trends at the Forest Scale

Implementation of the proposed action may affect individual oak woodland-dependent avian species but is not expected to have any measurable impact on the ability of these species to breed and reproduce in oak woodland habitats on the Sierra National Forest. Based on existing home range data for these species, ground-disturbing activities in oak woodland habitat that are as large as five acres in size may adversely affect one breeding pair; however, given the project design standards and Best Management Practices that are in place, such disturbances will not be common or widespread. Therefore, with the project resulting in an increase in the quality and quantity of oak components of mixed conifer forest, the project may increase the suitable habitat for these species. Thus, the direct, indirect, and cumulative effects of the alternatives are not expected to change the current Forest scale habitat or population trends for oak woodland avian species on the Sierra National Forest.

Meadow Edge Avian Species, MIS

See the discussion under Riparian Avian Species above for full discussion of this species guild.

Mature Mixed-Conifer Avian Species, MIS

Habitat-Species Relationships and Forest Habitat and Population Data

The California Spotted Owl, Northern, Olive-sided Flycatcher, and Western Tanager were selected to represent a range of mixed conifer forest habitats, from open forests to

dense mature forests. The California Spotted Owl and Northern Goshawk are addressed separately in this MIS report and are analyzed in depth in the biological evaluation for the KRP.

The Olive-sided Flycatcher (OSFL) is an uncommon to common breeding resident from May – August in a wide variety of forest and woodland habitats below 2800 m (9000 ft) throughout California exclusive of the deserts, the Central Valley, and other lowland valleys and basins (CWHR 2005). The Western Tanager (WETA) is a common breeding resident of montane forests from May through August throughout most of California, including coastal ranges; it is common and widespread in migration in foothills and lowlands, and winters rarely along the coast, mostly south of Monterey Bay (CWHR 2005).

Management concerns for these species are summarized as follows, using information contained in the Sierra National Forest's MIS Report (USDA Forest Service 2006). "The Olive-sided Flycatcher's association with decreased canopy cover allows it to respond positively to timber management. Using fire as a management tool also benefits the Olive-sided Flycatcher. Many studies indicate an increase in Olive-sided Flycatchers as canopy cover decreases (CALPIF 2002).

"Most sources suggest that Western Tanagers are not harmed by disturbances and favor stands with openings and edge or ecotone situations including those associated with second growth after logging, lake margins, and rock bluffs. However, in mixed-conifer forests of the Sierra Nevada, densities were significantly reduced after natural fires (CALPIF 2002 referencing Bock and Lynch 1970). Brood parasitism should always be a concern in locations that could potentially harbor large cowbird populations, especially areas with large amounts of grazing (CALPIF 2002)."

Throughout migration and during breeding, these two species may be found in habitats other than mixed conifer forests; however, for the purposes of this analysis for Management Indicator Species, the only habitat that will be addressed below is mixed coniferous forests, the primary breeding habitat for these two species in the Sierra Nevada.

During the period ranging from 1996 to 2006, mixed conifer habitat in general increased from 232,000 to 240,000 acres (USDA Forest Service 2006). Using the description of suitable habitat provided above for the Western Tanager and Olive-sided flycatcher, suitable habitat currently on the Sierra National Forest for these two species is approximately 79,000 acres for the WETA and 67,000 acres for the OSFL.

Population trend data for each of these species is shown in following table and is adapted from information in the Sierra National Forest MIS Report (USDA Forest Service 2006). Within the Sierras and at a statewide scale, populations of the Western Tanager are likely stable while populations of the Olive-sided Flycatcher are definitely decreasing. Population trends for these species at the North American scale of the entire BBS are similar, except that the data reflects an even more stable population for Western Tanagers.

Population trends for mixed conifer avian species, as computed from BBS data for the 1966-2004 survey period.

	Population Trend Summary For Mixed-Conifer Avian Species		
Species Name	Sierra Nevada	California	Survey-Wide
Western Tanager	Likely Stable	Likely Stable	Definitely Stable
Olive-sided Flycatcher	Definitely Decreasing	Definitely Decreasing	Definitely Decreasing

At the Forest scale, the Western Tanager is monitored on eight of nine BBS routes with an average population trend estimate of 3.89% per year; and the Olive-sided Flycatcher is monitored on six of nine BBS routes with a an average population trend estimate of –1.67% per year (Appendix 1mis). All Forest-level average population trend estimates provided here only utilized the LOESS trend estimator (Appendix 1mis).

For more detailed information on habitat-species relationships and forest habitat and population data, see the Management Indicator Species Specialist Report – Kings River Project (Robinson 2006).

Direct, Indirect, and Cumulative Effects of the Proposed Action

The proposed activities (Alternatives 1 and 3) will begin implementation of a landscape level program of uneven-aged silviculture and prescribed fire on over 9,000 acres within the approximate 13,700-acre project area. Specifically, 9,751 acres are planned for mechanical treatments using a combination of methods (e.g., helicopter, tractor bunch, etc.). Herbicides (glyphosate) will be applied to 1,183 acres, and prescribed burning would occur on over 9,000 acres.

Currently, the dominant CWHR forest types across the initial eight management units are Ponderosa pine (28%) and Sierra mixed conifer (43%). Sierra mixed conifer habitat currently comprises 5,926 acres across the initial eight management units.

Implementation of the proposed activities (alternatives 1 and 3) would result in acres of coniferous forest (e.g., Ponderosa pine, red fir, Sierra mixed conifer) dropping by about 111 acres in size classes 2 and 3 and by about 160 acres in size classes 4 and 5 (Tables 6mis, 7mis, and 8mis). These changes, however, are small compared to the existing condition within the project area and the more than 56,000 acres of coniferous forests within the approximate 72,000 acres comprising all 80 management units of the KRP (Tables 9mis and 10mis). Over the following ten years, considering all of the reasonably foreseeable and ongoing activities identified at the beginning of Chapter 3 of the FEIS, additional changes are expected; however, as shown above, the magnitude of these shifts is likely to be small compared to the total acres available.

Noise from the operation of equipment in or adjacent to mixed conifer stands may cause intermittent or periodic disturbance to species in these habitats. Birds tend to temporarily move away from noise-generating activities; however, the full effects of noise

disturbance are not known and are certainly expected to vary between species. Depending on the timing and location of the proposed activities, nests of some individuals may be disturbed or destroyed. The proposed actions do not increase the amount of grazing activity in the planning area and are therefore not expected to have any measurable impact on cowbird parasitism rates or grazing pressures that may be affecting the WETA. Forest management and prescribed fire activities foster the development of open spaces or ecotone habitats favored by both of these species. Additionally, the project will increase the quality and quantity of hardwood components of mixed conifer forest that WETA are associated with and increase forest openings that OSFL favor.

The No Action alternative would have no direct impact on the mixed coniferous forest species or their habitat. The opportunity to increase the number of large trees, increase the representation of shade intolerant hardwoods, and create a more diverse open forest structure favored by these species would be lost under this alternative.

The combination of reintroducing fire to the landscape, creating small openings or edge habitat, enhancing black oak, and increasing the number of large trees over time will have a mostly beneficial cumulative effect on species such as the Olive-sided Flycatcher and Western Tanager, whose environmental preferences and life history needs are dependent on the presence of these habitat elements. The mixed conifer habitat type is the most abundant habitat type (43% of existing vegetation) in the project area (Table 6mis). Over time, as the KRP and other projects are implemented, the location of prime habitat for these species will gradually shift as some stands mature and others are thinned or harvested as they would have under the natural disturbance regime that these species evolved with in the Sierra Nevada. As the role of fire has been reduced in shaping Sierra Nevada forests mechanical treatments and prescribed fire as proposed in this project can mimic natural disturbance and increase habitat quality for these and other mixed conifer forest bird species. In the long-term, and at a much larger scale, overall cumulative impacts to species such as these which migrate to Central or South America, will involve an integrated combination of factors taking place on their breeding grounds and habitat loss occurring on the species' wintering grounds.

Project Impacts to MIS Population Attributes or Trends at the Forest Scale

Implementation of the proposed action may affect individual mixed conifer-dependent avian species but is not expected to have any measurable impact on the ability of these species to breed and reproduce in these habitats on the Sierra National Forest. Based on existing home range data for these species, ground-disturbing activities in Sierran mixed conifer habitat that are seven acres or larger may adversely affect one breeding pair of Western Tanager; disturbances across larger areas may impact a territory of Olive-sided Flycatcher. However, given that forest management and prescribed fire activities foster the development of open spaces or ecotone habitats that are favored by both of these species, some of these disturbances may benefit these species. Therefore, the direct, indirect, and cumulative effects of the alternatives are not expected to change the current Forest scale habitat or population trends for mature mixed conifer avian species on the Sierra National Forest.

All Terrestrial Species

Direct Effects from Spraying Glyphosate and a Surfactant (R-11) of Alternative 1 and 3

No direct effects are expected to occur because the herbicide (Accord plus R-11) would not be applied to fish and wildlife unless an accident occurs or project design features are not followed. The VMFEIS (on pages 4-43 to 4-45) describes an analysis of direct effects to wildlife such as rubbing against or eating treated vegetation and concludes none are likely to occur.

Indirect and Cumulative Effects to Terrestrial Species from Spraying Glyphosate and a Surfactant of Alternative 1 and 3

There is little effect on fish or wildlife if glyphosate is applied at the recommended rate. The toxicity is extremely low because it is highly water soluble, so does not bioaccumulate, and because the mode of action is by inhibiting the formation of the amino acid phenylalanine. This is one of the essential amino acids, which cannot be synthesized by animals, so it is affecting a process only carried on by plants (Newton and Knight 1981).

For additional information on the likelihood of glyphosate having an estrogen mimicking effect, see the Section on Aquatic Species.

Direct, Indirect and Cumulative Effects from Spraying Glyphosate and a Surfactant (R-11) of Alternative 2

There are no effects.

Determinations for All Alternatives

Alternative 3 is similar to Alternative 1, except that the uneven aged management strategy is modified to reduce vegetation treatments to trees 30" dbh and smaller (compared to 35" dbh and smaller in Alternative 1); protection measures for the Pacific fisher (*Martes pennanti pacifica*) are adopted; and all treatments outside of the research areas will be consistent with the standards and guidelines in the SNFPA ROD (USDA 2004).

Alternative 1, the Proposed Action and Alternative 3, the Reduction in Harvest Tree Size Alternative Determinations

Based on the above assessment of direct, indirect, and cumulative effects, the District Biologist determined that implementation of the Kings River Project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the California Spotted Owl under alternative 1 and 3. This determination is based on:

1. Although operations may affect individual owls or owl pairs through changes in forest structure and disturbance effects, the overall reduction in fire hazard and an emphasis on uneven-aged management will help maintain larger amounts and better California Spotted Owl habitat throughout the planning area.

2. Operations will affect between 1881 and 4729 acres yearly, which represents between 1.5% and 3.5% of the planning area, respectively.
3. Because of the dispersed nature of the project, we assume that foraging owls could select areas away from the operational disturbance and reduce the impact on any individual's reproductive potential.
4. Loss of habitat across all PACs would range from one acre up to 36 acres per individual PAC, with an average loss of 6.6 acres of suitable habitat. The amount of suitable habitat would not change under the proposed activities for five PACs.
5. Based on the amount of forested habitat with more than 40% canopy closure and the amount of suitable habitat within owl home ranges, the potential for reproduction in the project area appears very good and the capability for owls to replace themselves exists throughout the entire project area. These conditions would persist under both of these alternatives.
6. The activities proposed in the KRP are within the scope of effects considered and described by the USFWS in its 12-month finding to not list the California Spotted Owl. As a result, the KRP would not result in any cumulative effects that are greater than those already analyzed by the USFWS when it determined that listing of the California Spotted Owl as Threatened or Endangered is not warranted at this time.

The District Biologist determined the Kings River Project under alternative 1 or 3 may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the marten because martens may forage in the area. As vegetation treatments are implemented it may cause noise disturbance and the animals may leave the areas for a short time. Overall, resting habitat in the area will increase once vegetation treatments occur and in the long term it will allow more space for trees to grow larger and therefore provide habitat for two (foraging and resting) of the marten's three life history needs (denning, foraging, resting).

The District Biologist determined the Kings River Project under alternative 1 and 3 may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the fisher because:

1. An estimated 28-36 individual fishers inhabit the KRP. It is thought the numbers are stable (Purcell 2006).
2 The dispersed nature of the project allows foraging fisher the opportunity to move away from operation disturbance and there is anecdotal information they do so.
3 Several provisions have been made in the design of the management units (and the scheduling of treatments within them), as discussed above, to minimize effects and improve habitat. These include:
    a. Provisions for OFL
    b. Meeting the need to increase the number of large trees
    c. Designing management units in a manner that limits their size and disperses the treatments within them over time
    d. Minimum canopy cover retention levels based on historic and geographic information that provides evidence the levels are sustainable over time in a fire adapted ecosystem

4 Operations will affect between approximately 4,726 acres and 1,881 acres yearly. This represents between 1.5% and 3.5% of the planning area for however long the treatment of management units continues.
5 The UMS according to the fire modeling described above will reduce the loss of habitat when a severe fire strikes a management unit.
6 Part of the purpose and need is to provide the opportunity to study the effects of the UMS and prescribed fire on fisher and their habitat as envisioned by the proposed PSW monitoring study. That need will be met under these alternatives.
7 The Fish and Wildlife Service found the fisher is proposed for listing for the following reasons:
    a. low reproductive rate
    b. low dispersal abilities
    c. its dependence on closed canopy, late successional forests in West Coast range
    d. alteration of forest habitats as a result of logging and conversion to other land uses

8 The proposed project will improve the primary habitat issue – the impact of fires and the effects of future fires. If alternative 1 or 3 is implemented it will move the habitat closer to high suitable habitat and reduce the habitat fragmentation due to wildfire.

The District Biologist determined that under alternative 1 and 3 the Kings River Project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the Wolverine and the Sierra Nevada red fox because there is suitable habitat in the KRP planning area and although there are no animals present today, one or both of the species could reoccupy the area at sometime in the future.

Under alternative 1 or 3, the District Biologist determined the Kings River Project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the goshawk due to noise disturbance from mechanical and prescribed fire activities. It may be a short term negative effect to the species for the reasons listed above; however, it will be a long term beneficial effect because it will increase tree size and canopy over time.

Under alternative 1 and 3 the District Biologist determined the Kings River Project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the Great Gray Owl because the owls may use the trees for roosting, or the area for foraging, as well as they may leave the area because of smoke when underburning or when vegetation treatments occur. It will be a short tem effect to the species and a benefit in the long run due to the removal of suppressed trees, allowing the growth on dominant trees to grow larger. The owls will continue to use the areas for foraging.

Under alternative 1 and 3 the District Biologist determined the Kings River Project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the Pallid bat because the bats may use the trees for roosting, and they may

leave the area because of smoke during underburning activities. There would also be noise disturbance to the bats while logging occurs.

Under alternative 1 and 3 the District Biologist determined the Kings River Project will not affect the Townsend's big-eared bat because treatments are not occurring within or adjacent to their habitat.

Alternative 2 – No Action Determinations

Based on the above assessment of direct, indirect, and cumulative effects, the District Biologist determined that alternative 2 of the Kings River Project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the California Spotted Owl. This determination is based on the assumption that taking no action maintains or exacerbates the current effects of stand-replacement fire over time – leading to a potentially greater loss of suitable habitat should one or more fires occur within the planning area.

Under alternative 2, the District Biologist determined the Kings River Project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the martin or fisher. This determination is based on the assumption that taking no action maintains or exacerbates the current effects of stand-replacement fire over time – leading to a potentially greater loss of suitable habitat should one or more fires occur within the planning area.

The District Biologist determined that under alternative 2 the Kings River Project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the wolverine and the Sierra Nevada red fox because there is suitable habitat in the KRP planning area and although there are no animals present today, one or both of the species could reoccupy the area at sometime in the future.

Under alternative 2, the District Biologist determined the Kings River Project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the great gray owl or goshawk. This determination is based on the assumption that taking no action maintains or exacerbates the current effects of stand-replacement fire over time – leading to a potentially greater loss of suitable habitat should one or more fires occur within the planning area.

Under alternative 2, the District Biologist determined the Kings River Project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the Pallid bat. This determination is based on the assumption that taking no action maintains or exacerbates the current effects of stand-replacement fire over time – leading to a potentially greater loss of suitable habitat should one or more fires occur within the planning area.

Under alternative 2, the District Biologist determined the Kings River Project will not affect the Townsend's big-eared bat because treatments are not occurring within or adjacent to their habitat.

Table 3-41 - Summary of determinations for All Alternatives

Species	Status	Determination for the Initial Eight Management Units of the Kings River Project
California spotted owl	Forest Service Sensitive Management Indicator Species	***may affect, but is not likely to lead to federal listing or loss of viability***
Marten	Forest Service Sensitive Management Indicator Species	***may affect, but is not likely to lead to federal listing or loss of viability***
Fisher	Federal Candidate Forest Service Sensitive Management Indicator Species	***may affect, but is not likely to lead to federal listing or loss of viability***
Wolverine	Forest Service Sensitive	***may affect, but is not likely to lead to federal listing or loss of viability***
Sierra Nevada red fox	Forest Service Sensitive	***may affect, but is not likely to lead to federal listing or loss of viability***
Northern goshawk	Forest Service Sensitive	***may affect, but is not likely to lead to federal listing or loss of viability***
Great gray owl	Forest Service Sensitive	***may affect, but is not likely to lead to federal listing or loss of viability***
Pallid bat	Forest Service Sensitive	***may affect, but is not likely to lead to federal listing or loss of viability***
Townsend's big-eared bat	Forest Service Sensitive	***no effect***

SOILS

Affected Environment

The project area is underlain with 13 soil types that combine into 25 soil map units. The most dominant soils affected by the project include: Shaver family, Holland family, Chaix family, Gerle family, Cagwin family, Umpa family, Chawanakee family, Sirretta family, Auberry family, Tollhouse family, and Typic Xerumbrepts. The soils that have the greatest extent or acreage within the proposed treatment areas are Shaver family, Holland family, Cagwin family and Gerle family. The majority of soil in the project area is moderately deep (20-40 inches) to deep (60 inches). Shaver family and Holland family soils are deep (> 40 inches). Some areas of shallow soils (< 20 inches) and rock outcrop occur in the area and these soils consist of Chawanakee family, Dystric Lithic Xerocrepts, and Tollhouse family soils. The soils vary in characteristics from shallow to deep, thermic to frigid temperature regimes, xeric moisture conditions and have developed in metamorphic and granitic parent materials (Giger, 1993). See soils report in the project file for more information.

Soils in the proposed project area vary in their sensitivity to management. Soils with higher clay content and soil moisture have the highest potential to reduced soil porosity. Soil compaction can occur down to 12" deep. Soils that are shallow have the potential for a loss of soil productivity.

There is a concern that:

- Areas proposed for ground based harvest have soils that are highly susceptible to reduction of soil porosity caused from compaction by heavy equipment operating when soils are moist or wet.
- Prescribed fire and tractor piling will reduce soil cover and accelerated erosion could result in a loss of soil productivity.
- Ground based harvest systems on slopes that are too steep or have shallow soils will displace surface soil horizons that could result in accelerated erosion and reduced soil productivity.

Ground disturbance within RCA's was determined by analyzing areas that will have ground disturbing activities within the eight proposed management units. The definition of ground disturbing activities according to the Sierra Nevada Forest Plan Amendment is " activities that result in detrimental soil compaction or loss of organic matter beyond the thresholds identified by soil quality standards" (USDA, 2004). These activities include tractor logging or some form of tractor piling or some form of heavy equipment operation off of established roads. Helicopter logging and prescribed fire are not considered ground disturbing activities.

The total acres of RCA's in the 8 proposed management units are 11,556 acres or 83% of the total project area (13,847 acres). Approximately, 4,743 acres of RCA in the project area either is not included in the project proposal or the areas are proposed for "no treatment" or as a "control" in the case of the krew_prv_1 and krew_bul_1 management units. An additional 2,628 acres will not be disturbed because these areas are either streamside management zones and are equipment exclusion zones where ground disturbing activities will not permitted or they are proposed for helicopter logging with under burning or gross yarding for fuel treatments, which are also considered non-ground disturbing. Gross yarding will result in removing the whole tree with a helicopter to a landing where processing of the tree will occur on a landing. The resultant RCA that will be disturbed is 4,185 acres or 36.21%.

The 4,185 acres of disturbed ground will not be completely disturbed. Design measures for the Kings River Project include maintaining at least 90% of the soil porosity over 15% of an activity area found under natural conditions. This means that up to 15% of an activity area can have disturbed ground. Applying 15% disturbance factor to 4,185 acres of potentially disturbs ground in the RCA amounts to 5.43%. Therefore, a peer review will not be required for this project.

Holland soils have a moderate soil compaction hazard and high to very high maximum erosion hazard rating. These soils are most sensitive to management and they occur in soil map units 136, 137, 138, 139, and 140. These soil map units occur in the South of Shaver 1 (SOS-1) project area, providen_1, n_soapro_2, bear_fen_6, providen_4, and krew_prv_1 management units.

Soil map units with high amounts of impervious surfaces such as rock outcrop or shallow soils are most susceptible to runoff and subsequent surface erosion of soils adjacent to the rock outcrop. Soil map units with a rock outcrop component include soil map units 126, 150, 148, 123, 159, 166, 110, 113, 116, 147. Soil map units with inclusions of rock outcrop and or shallow soils include soil map units 139, 135, 138, 140, and 112. These soil map units are distributed throughout all proposed project areas and are a concern for increased runoff and potential accelerated erosion of soils below the rock outcrop and within the shallow soils.

Areas proposed for ground based harvest systems are generally less then 35%. However, some areas exist where slopes exceed 35% and tractor logging could result in soil disturbance that mixes or removes soils below the A horizon.

Some areas are proposed for treatment where rock outcrop and or shallow soils are extensive. These areas have low soil productivity and should not be treated in the proposed action. These areas have been identified from the Order 3 Soil Survey, which is not designed for project planning. Review of digital orthographic quadrangle photos identified that some of those areas of rock out crop are not mapped accurately and some are mapped accurately. The ID team determined that rock outcrops and associated shallow soils are not part of the proposal and during project layout those areas will be excluded.

Soil conditions have been reviewed in all proposed management units. Soil transect data was collected and evaluated in the providen-1, n_soapro_2, bear_fen_6, providen_4, glen_mdw_1, and el_o_win_1 management units. Soil data for the krew_prv_1 and krew_bul_1 management units consisted of data collected by the PSW Fresno lab as part of their base line data collection for their watershed study. This data includes soil cover, large woody debris, and soil bulk density (soil compaction).

Forty eight soil transects consisting of 20 points per transect were collected to characterize soil conditions using the 2005 Framework Soil Monitoring Methods Protocol. Data for soil cover, soil disturbance, soil compaction and large woody debris were collected along transects and summarized in the 2005 Kings River Project Soils Monitoring Report, (Alvarado, 2005) and the 2006 Soil Conditions Report for the n_soapro_2, glen_mdw_1, krew_prv_1, and krew_bul_1 management units. This data will serve as baseline conditions from which to compare soil conditions in the future. Soil transects data showed that soil cover ranges from 86% to 100%, which is well over the Forest Soil Standard and Guideline. Soil compaction ranges from less then 1% to 12.2%. Some areas in the bear_fen_6 management unit have excessive levels of soil compaction that do not meet Forest Standard and Guidelines. Large woody debris (LWD) ranged from 23 to 1.1 pieces/acre. The only areas that do not meet the Forest Standard and Guideline for large woody debris are the providen_4, n_soapro_2, and glen_mdw_1 management units. These areas average 1 piece/acre of large wood debris.

Soil Survey Data

The Glen_Mdw_1 and krew_bul_1 management units have coarse textured, moderately deep to deep soils with less then 25 acres that have been treated in the last 5 years. Soil cover data from the soil transects collected in the other management units shows that existing soil cover is meeting the Forest Soil Quality Standard and Guidelines. In