

Fed. Defs.' Ex. A

Part 3 of 3

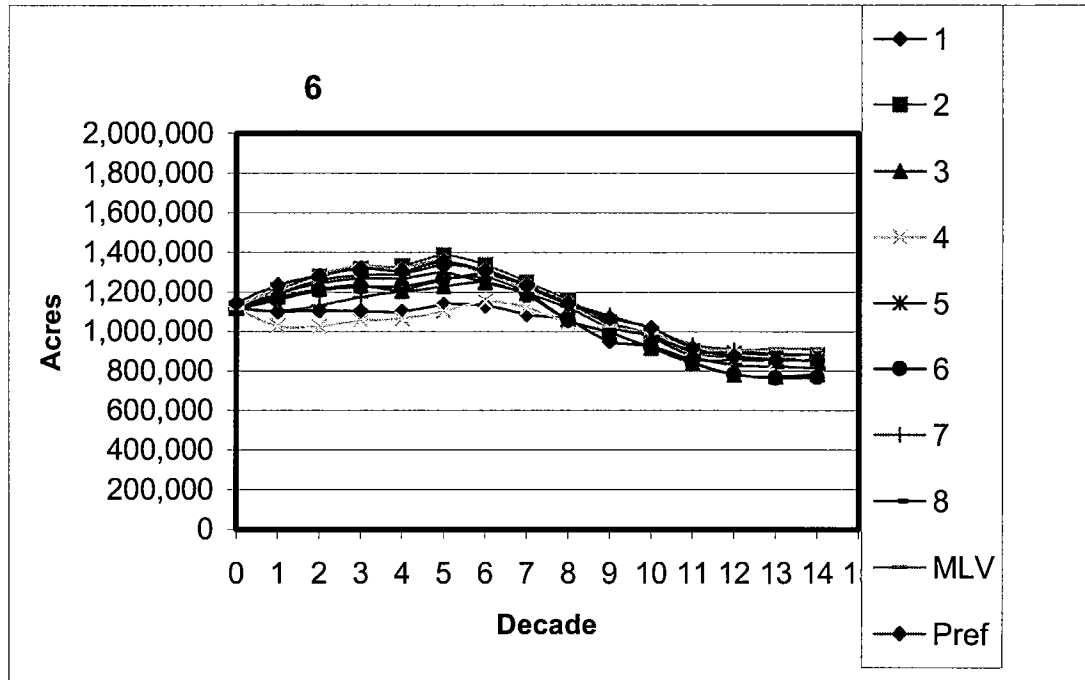
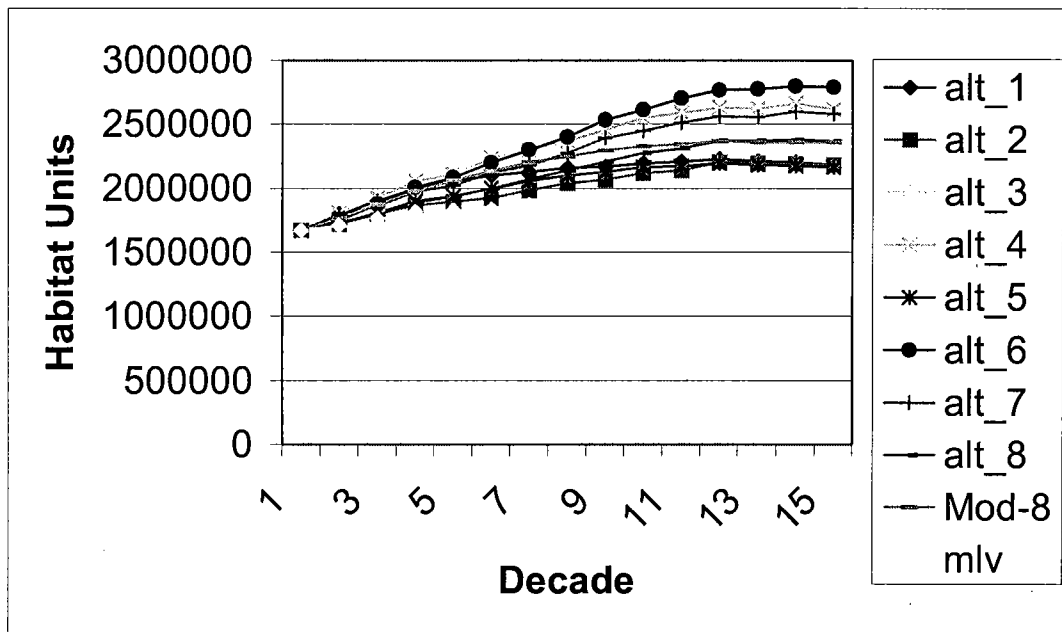
Figure 4.4.2.1g. Region-wide projected change in CWHR class 6.**Figure 4.4.2.1h.** Region-wide projected change in overall CWHR habitat suitability units for the California spotted owl.

Table 4.4.2.1f. Projected percent changes in the amount of high and moderate suitability spotted owl nesting and foraging habitat from the current to 50 years in the future under the FEIS Alternatives.

CWHR Strata						
Alternative	6	5D	5M	4D	4M	Total
Current (1,000s acres)	1,120	166	662	1,145	1,206	4,301
MLV*	21.5	341.9	46.7	-38.6	-37.3	5.4
1	1.7 –	386.5	77.5	-40.9	-32.8	7.3
2	23.9	382.3	60.9	-38.7	-35.3	10.2
3	9.7	552.6	84.4	-41.8	-29.0	17.6
4	-1.4 –	388.2	107.2	-47.7	-26.2	11.0
5	16.0	434.6	67.7	-42.3	-32.5	10.8
6	13.5	500.9	88.7	-41.8	-31.2	16.7
7	13.2	400.8	85.7	-40.6	-28.9	13.3
8	19.6	401.8	72.7	-41.0	-33.5	11.4
Mod-8	18.4	454.7	67.3	-39.7	-34.2	12.8
Mean Change	13.6	424.4	75.9	-41.3	-32.1	

*MLV = No Treatment, Let-Grow Scenario

Table 4.4.2.1g. Projected percent changes in overall habitat suitability scores based on CWHR habitat models from the current to 50 years in the future across the FEIS Alternatives.

Alternative										
MLV*	1	2	3	4	5	6	7	8	Mod.-8	Mean
9.9	25.8	15.0	32.9	34.3	19.6	31.7	27.0	19.7	27.9	24.4

*MLV = No Treatment, Let-Grow Scenario

B. Amount of Habitat Provided in Owl Home Ranges

Studies have documented a relationship between the proportion of a landscape covered by habitat and the ability of spotted owl pairs in that landscape to survive and reproduce at replacement rates (Bart, 1995, Franklin et al. 2000, Hunsaker et al. *in press*). Given declining owl populations, this relationship is particularly important for evaluating opportunity for a particular alternative to stabilize population declines. Existing information suggests that approximately half of spotted owl home ranges in the Sierra Nevada currently provide the amount of moderate- and dense-canopied stands found to be associated with higher levels of owl occupancy and productivity (CWHR classes 6, 5D, 5M, 4D and 4M). On average, spotted owl home ranges in the northern and southern Sierra Nevada provide higher amounts of habitat than those in the central Sierra Nevada, due in part to more contiguous national forest land. Increasing the number of owl sites with desired amounts of habitat is likely important to stabilizing current population declines.

Modeled habitat projections indicate that all alternatives contribute to increasing amounts of spotted owl habitat over a 50-year timeframe. These broad-scale projections do not, however, ensure that the distribution of this habitat will be sufficient to maintain occupancy or productivity within individual spotted owl sites. Alternatives 1, 3, 4, 6, and 7 lack direction that specifies amounts of habitat to be retained within the specific areas known to be utilized by spotted owls (i.e. home range areas). In the absence of this direction, habitat distribution remains a major area of uncertainty in these alternatives. It is difficult to determine the extent

to which these alternatives will provide habitat likely to support higher levels of owl occupancy and productivity.

Alternatives 2, 5, and 8 provide a greater degree of certainty that sufficient habitat will be retained within spotted owl home ranges. Alternative 8 retains all existing suitable habitat while Alternatives 2 and 5 provide direction for maintaining 50 percent of each California spotted owl home range in suitable habitat. Only Modified Alternative 8, however, provides suitable habitat within the most used core area surrounding the PAC. (This concern is minor for alternative 2, however, since treatments affect such a small proportion of the landscape).

A number of studies indicate that habitat concentrated in close proximity to the nest or activity center is of greater value since owls are known to concentrate their foraging activities close to the nest (Solis and Gutierrez 1990, Bart 1995, Bingham and Noon 1997, Hunsaker et al. *in press*). This observation is supported by analyses for the California spotted owl that find greater concentrations of suitable habitat as the analysis area becomes smaller in size surrounding the owl nest site (Hunsaker et al. *in press*). Alternatives 2, 5 and 8 provide a greater degree of certainty about retention of habitat within home ranges occurring in the general forest, than do the remaining alternatives. Modified alternative 8 increases the effectiveness of this habitat protection, however, by providing direction that would concentrate high quality habitat within a core area closest to the activity center.

C. Amount of Habitat Provided Within Owl Home Ranges Occurring in Geographic Areas of Concern.

As described in the Technical Report, several geographic areas of concern for the California spotted owl occur throughout the Sierra Nevada (Verner et al. 1992:45, 47, 48). The Technical Report cautioned that these are areas where management decisions may have a disproportionate potential to affect the spotted owl population. Given documented population declines, the extent to which alternatives provide sufficient habitat to maintain spotted owl sites within the areas of concern is an important consideration. None of the alternatives provides unique management direction specific to these areas. Alternatives which lack objectives for habitat maintenance in spotted owl home ranges (Alternatives 1, 3, 4, 6, and 7), lack assurances that vegetation treatments will not reduce the occupancy and productivity of owl sites in these areas. This is particularly the case in the Areas of Concern that include checkerboard land ownership patterns or fragmented habitat. Management actions have potential to disproportionately impact owl sites in these areas given the existing status of habitat. With past and continuing habitat alteration on non-federal lands (see cumulative effects discussion), alternatives 1, 3, 4, 6 and 7 provide little assurance that owl sites will not decline within these areas of concern, increasing nearest neighbor distances and reducing the likelihood for successful dispersal and mate finding.

In the areas of concern that are fragmented landscapes or have checkerboard land ownership patterns, Alternatives 2, 5 and Modified 8, provide a higher likelihood of providing for replacement rate reproduction for owl sites within these areas by establishing an objective for the amount of habitat in each owl home range. Under these alternatives, even where a large proportion of the spotted owl home range occurs on non-federal lands, the entire habitat objective must be met on national forest land. This is particularly important in areas where national forest lands are highly fragmented since providing sufficient habitat to maintain spotted owl occupancy and productivity in such areas may require that all of the available national forest land be managed to as suitable spotted owl habitat.

An additional concern, however, is that a large proportion of the landscapes supporting owl sites within these areas of concern, particularly those areas with fragmented habitat and low population densities (designated in the Technical Report as areas A, B, 1, 4, 5, 7, and 8 occurring on the Lassen, Eldorado, Stanislaus, Sierra, and Sequoia National Forests) already may provide less than the desired amounts of habitat within owl home ranges to maintain non-declining populations. Bart (1995) cautions that it should not be assumed that habitat in all home ranges can be reduced to a threshold level without adverse effects on the population. Alternatives which establish minimum thresholds for the amount of habitat within owl home ranges, may not provide direction sufficient to stabilize owl populations within these geographic areas of concern. In areas of concern where a greater proportion of owl home ranges have less than desired amounts of habitat to begin with, reducing the amount of habitat within the few home ranges that exceed the habitat threshold, prior to increasing amounts of habitat in other owl home ranges, could increase the risk of worsening conditions and increasing nearest neighbor distances for owl sites within these areas.

The strategies proposed in Alternative 2 and Modified Alternative 8 present the least risk of worsening habitat conditions within owl sites occurring areas of concern. Risk is low in Alternative 2 because biodiversity reserves encompass a high proportion of owl sites in areas of concern. Risk is low in Modified Alternative 8 because vegetation treatments are designed to maintain suitable habitat across the landscape (see below); thus, vegetation treatments would not allow for all home ranges within the general forest area to be reduced to a minimum threshold amount of suitable habitat.

D. Effects Upon Habitat in Owl Home Ranges Associated with Implementation of the HFQLG Forest Recovery Act

The Biological Evaluation for the HFQLF Forest Recovery Act, estimates (1) a 7 to 8.5% decrease in suitable owl habitat under HFQLG Alternative 2, and (2) an 8 to 11 percent decrease in the number of owl sites with greater than 50 percent suitable habitat within their home range area. This decrease in suitable habitat results in 36% of the owl sites in the project area having less than the amounts of habitat thought to be associated with higher rates of site occupancy and productivity. The Lassen and Plumas National Forests, and Sierraville Ranger District of the Tahoe National Forest support about 30 percent of the known spotted owl sites on National Forest land in the Sierra Nevada. If management actions reduce owl occupancy and productivity across this area (as expected under alternative 2 of the HFQLG), opportunities to stabilize population declines could be substantially compromised.

Population declines that would occur within the three geographic areas of concern located within the HFQLG project area, exacerbate the overall risk to spotted owl population. In particular, Area of Concern 1, occupying a large portion of the Lassen National Forest, is an area where habitat fragmentation decreases the density of spotted owl pairs, making successful dispersal more difficult. Actions proposed under Alternative 2 of the HFQLG will widen gaps between habitat parcels and probably reduce the densities of owls within this area of concern (Biological Evaluation for the HFQLG Forest Recovery Act, 1999).

E. Effects on Habitat Suitability for select prey species of the California Spotted Owl.

Projected changes in overall habitat suitability scores for select California spotted owl prey species were estimated using CWHR habitat suitability ratings and vegetation projections (Appendix B). Overall, 65% of the species (11/17) had average projected increases in habitat suitability across the alternatives, while 8 species had projected decreases (Table 4.4.2.1h). Overall the results are

consistent with the general projections of increasing amounts and distribution of late-seral/old-growth forest conditions along with an increase in prescribed burning and wildfire. Some of the species that are also abundant in riparian and meadow environments that were not fully modeled in the vegetation projections should remain abundant throughout the Sierra Nevada despite modest projected decreases in habitat suitability within the forested vegetation types.

Table 4.4.2.1h. Projected percent changes in overall habitat suitability scores for select prey species of California spotted owls based on CWHR habitat models from the current to 50 years in the future across the FEIS Alternatives.

SPP Code	Species Name	Alt1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Mod 8	MIv	Mean
M080	No. Flying Squirrel	12.0	4.2	17.3	18.5	7.5	16.1	12.8	7.5	11.9	0.6	10.8
M127	Dusky-footed woodrat	0.8	-3.9	-3.3	-1.8	-3.0	-3.7	0.6	-3.6	5.2	-3.2	-1.6
M128	Bushy-tailed woodrat	8.3	2.6	5.6	6.4	4.2	5.2	4.1	4.0	9.0	3.3	5.3
M129	Western Red-backed vole	13.3	-0.3	6.0	10.7	6.6	5.4	2.5	0.6	10.8	-2.5	5.3
M117	Deer Mouse	1.2	-3.3	-2.0	-2.5	-2.2	-2.3	-2.8	-2.8	1.5	2.2	-1.7
M113	Western Harvest Mouse	215.1	184.8	165.1	163.8	208.0	161.3	162.0	184.3	215.1	210.2	187.0
M085	Mountain Pocket Gopher	39.4	28.8	5.2	7.3	30.6	2.7	10.0	21.4	35.3	46.3	22.7
M081	Botta's Pocket Gopher	55.4	44.6	16.5	12.0	39.2	11.6	19.9	32.0	43.6	68.4	34.3
M134	California Vole	153.5	165.4	54.1	31.9	146.3	59.2	67.0	129.4	126.6	183.6	111.7
M133	Montane Vole	177.6	171.5	171.3	173.2	173.6	171.4	171.0	171.5	178.2	173.0	173.3
M136	Long-tailed Vole	-5.4	-13.1	-16.9	-10.7	-13.0	-16.0	-12.0	-13.2	-5.1	-10.8	-11.6
M130	Heather Vole	-5.8	-6.4	-9.6	-6.9	-6.6	-8.5	-5.5	-6.9	-4.2	-6.3	-6.6
M006	Ornate Shrew	-4.5	-10.3	-1.7	-2.9	-6.3	-2.0	-1.5	-8.3	-0.1	-11.6	-4.9
M004	Dusky Shrew	3.9	1.2	5.4	6.3	2.1	4.9	6.6	2.1	5.1	0.7	3.8
M012	Trowbridge's Shrew	4.0	-6.3	5.3	7.5	-2.4	4.2	1.9	-3.7	3.2	-8.3	0.5
M003	Vagrant Shrew	4.6	-9.8	-12.8	-1.4	-6.7	-12.1	-6.9	-9.1	1.1	-4.9	-5.8
M018	Broad-footed Mole	142.3	123.7	106.8	113.5	118.6	101.2	114.0	115.6	137.9	140.3	121.4

4. Levels and Types of Forest Management Activities.

A. Acres of Vegetation Treatments

As previously discussed, it is not possible to directly assess impacts on individual California spotted owl home ranges using habitat projections. Understanding the types of activities that might occur in proximity to known owl sites and the potential effects of these activities helps identify potential risks. In addition, retaining existing suitable habitat and improving habitat conditions over the next couple of decades may be particularly important for stabilizing owl populations. Research into population dynamics at larger scales has suggested the possible existence of habitat thresholds, below which populations may go extinct in the presence of suitable habitat due to constraints on successful dispersal. With current population declines, vegetation treatment impacts over a short time period may involve risks to the spotted owl population that are not evident by considering longer-term habitat projections alone.

All vegetation treatments, from prescribed fire to group selection, are designed to affect stand structure to reduce fuel loads and the risk of high severity wildfire and will in turn affect habitat suitability for owls. Non-treatment also has an effect in that natural processes of growth and mortality invariably change stand structure through time. The effects of treatment vary by treatment type and vary through time; some effects are negative in the short-term and positive in the long run, and vice versa. The shorter the time period between habitat alteration and recovery, the lower the risk associated with implementing a proposed management strategy. Canopy cover, canopy layers, and the average diameter of overstory trees appear to be important attributes within California spotted owl nesting and foraging habitats. Table 4.4.2.1i provides an estimate of the general likelihood of retaining these habitat elements at or above thresholds described for preferred nesting and foraging habitats, immediately following vegetation treatments. Table 4.4.2.1j displays the acres of treatment estimated to occur in the first and second decades under the various Alternatives.

Vegetation treatments anticipated under Alternatives 4 and 7 pose a greater risk of affecting owl sites than treatments under the remaining alternatives. Acres of more intensive vegetation treatments (those treatments with a high or moderate likelihood of changing suitable habitat to unsuitable habitat) are greatest in these alternatives. Alternative 4 and 7 are estimated to result in heavy thinning, group selections, seed tree, or regeneration harvest over approximately 288,000 and 277,000 acres, respectively, across the Sierra Nevada during the second decade. Alternatives 1 and 6 are intermediate in risk, similarly affecting about 155,000 and 113,000 acres respectively. Alternatives 2, 3, 5, 8 and modified 8 would each affect less than 50,000 acres with intensive treatments during the second decade. Alternative 2 and Modified Alternative 8 pose the least risk of reducing the acreage of suitable habitat as these alternatives are projected to result in no heavy thinning, group selections, seed tree or regeneration harvest.

Table 4.4.2.1i. Likelihood (high, moderate, low) of retaining important structural attributes of spotted owl habitat following vegetation treatment prescriptions projected in the alternatives.

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

Table 4.4.2.1j. Number of acres (in thousands) scheduled for vegetation treatments by alternative in the first and second decades (excludes brush, plantation, and retreatment acres).

Treatment Type	Alternative								Mod. 8
	1	2	3	4	5	6	7	8	
Prescribed fire (11, 15)	376	146	421	358	378	547	376	459	408
	266	257	679	389	449	662	266	512	
Biomass thin (21)	70	27	124	115	42	114	119	86	208
	70	32	148	139	30	134	128	82	
Light thin (31, 35)	252	29	110	467	15	142	363	20	52
	110	21	63	284	19	127	114	49	
Heavy thin (45, 51, 55)	180	0	20	174	10	33	99	12	36
	144	0	17	244	40	113	223	50	
Group selection, shelterwood, Regeneration (61,71,81)	54	12	47	104	32	44	118	21	0
	11	0	0	44	0	0	54	0	

B. Fragmentation Effects Resulting from Vegetation Treatments

Vegetation treatments that create openings or reduce suitable habitat will widen the gaps between habitat patches. Increases in the amount of discontinuous habitat and isolation of habitat patches are concerns within known owl home ranges as well as across the landscape. A reduction in the continuity of habitat between owl activity centers, including the habitat outside known owl home ranges, could limit successful mate finding and dispersal, increasing nearest neighbor distances and affecting population trends. In fragmented landscapes, the high survival costs associated with searching for low-density habitat can create a situation where populations may go extinct in the presence of suitable habitat due to constraints on successful dispersal. Reducing habitat fragmentation and maintaining patches of suitable but unoccupied habitat particularly in areas already identified as geographic areas of concern, is important from this standpoint.

The likelihood of vegetation treatments creating gaps and increasing habitat fragmentation are influenced by 1) the type of vegetation treatments applied, and 2) the scheduling of treatments. Alternatives 4 and 7 have a high likelihood of increasing the fragmentation of habitat considering these factors. Average annual treatments of about 28,000 acres with heavy thinning or group selection harvest, is projected under each of these alternative. Under these prescriptions, reduction in canopy cover will create substantial contrast between treated patches and remaining patches of habitat. Group selections, if implemented in a manner that creates very small, irregularly distributed, low density openings, may not result in fragmentation effects. Neither alternative provides sufficient direction on the frequency, size, and distribution of openings to assume that this is the case, however. The spatial location of treatments is uncertain, however both alternatives prioritize treatments within areas of high fire risk and hazard. Over the first decade, therefore, treatments would be expected to be more extensive within the lower montane zone mixed conifer and pine zone, increasing fragmentation effects in these more productive owl habitats. Vegetation treatments under Alternatives 1 and 6 would also increase habitat gaps, though to a lesser extent. Heavy thinning and a minor amount of group selection would affect about 10,000 to 15,000 acres annually under these alternatives.

Alternatives 3, 5, 8, would have minor amounts of treatment (less than 5,000 acres annually across the Sierra Nevada) that would increase habitat gaps. Alternatives 2 and Modified 8 avoid vegetation treatments that would create habitat gaps. Modified Alternative 8 provides

Standards and Guidelines explicitly limiting the extent to which canopy cover and structure can be adjusted downward.

C. Location of Vegetation Treatments in Relation to Geographic Areas of Concern

To the extent that treatments are concentrated (either in time or space), particularly within certain geographic areas of concern, the overall impacts of the actions upon spotted owl populations may be heightened. Under each of the alternatives, most planning of the spatial location of treatments is left to the national forest or ranger district. However, all of the action alternatives focus and prioritize treatments in vegetation types designated as high fire risk and hazard (typically mid- and lower elevation mixed conifer and pine forests) and place emphasis on treatments within the urban intermix zones. Modified Alternative 8 is most explicit in this direction, specifying that treatments will first occur, and be of higher intensity, in the urban wildland intermix zone. Alternatives 3, 4, 6, 7, 8 and Modified 8 also *emphasize* fuels vegetation treatments within strategically placed area treatments (SPLATs) in areas of high fire hazard and risk for fuels reduction (often on south and west aspects) Treatment is designed to occur over 30 percent of a watershed area under these alternatives.

Table 4.4.2.1k displays the proportion of spotted owl sites in each geographic area of concern, and in total, that occur within urban zones. In total, four percent of spotted owl activity centers occur within the “defense zone” of the urban intermix (the area within 0.25 miles of communities or developments). An additional 32 percent of owl sites occur within the “threat zone” of the urban intermix, and the remaining 64 percent of owl sites occur outside the urban zones. Within specific geographic areas of concern, the proportion of owl sites in urban zones ranges from 3 percent in AOC 1 on the Lassen National Forest, to as high as 78 percent within AOC 7 on the Sierra National Forest. Areas of concern 5 and 7 have a high proportion (greater than 70 percent) of owl sites occurring within the urban intermix zone, and are therefore likely to be at risk to impacts from vegetation treatments. Areas of Concern 3, 4, and 8 have more than a quarter of the known owl activity centers within the urban intermix zone.

Alternatives 4 and 7, with higher amounts of intensive vegetation treatments (heavy thinning, group selections, seed tree harvest), present the greatest risk to worsening habitat conditions within these areas. Assuming that treatments in the first decade are emphasized within the urban zones, and that vegetation treatments occur over 30% of the landscape, the lack of standards requiring habitat retention in owl home ranges, results in a likelihood that habitat conditions might decline within areas of concern 5, 7, 3, 4, and 8. This could further reduce low owl densities in and adjacent to these areas, decreasing the potential for successful dispersal and population interaction. Alternatives 1, 3, and 6, which do not require retention of habitat in owl home ranges, are also likely to impact these areas of concern. Risks are lower since projected acres of intensive treatments are less.

Alternatives 2, 5, 8 and Modified 8 provide greater assurances about maintenance of high quality habitat, even within urban zones. Home range protections and the extensiveness of reserve areas increases confidence that vegetation treatments under Alternatives 2 and 5 will not impact owl sites; limitations on treatment prescriptions under Alternative 8 ensure retention of suitable habitat. Modified Alternative 8 varies the intensity of treatments based on proximity to communities. Under this alternative it can be assumed that owl activity centers occurring in the urban core defense zone may not be maintained through time, given potential fuels treatment prescriptions. This is four percent of spotted owl sites Sierra Nevada-wide; it

represents 22 percent of owl sites in AOC 5. In modified alternative 8, slight reductions in canopy cover could impact habitat for the 32 percent of owl sites occurring in the urban threat zone, but impacts would be subtle. Treatment prescriptions are limited to understory thinning, with retention of at least 50 percent canopy cover. Subtle changes in habitat condition under this alternative are not expected to result in lower owl densities or lower productivity in owl sites. Opportunities for successful dispersal and population interaction will not be reduced. Vegetation treatments outside the urban intermix are lower priority. Such treatments, where 64 percent of owl sites are located, are further limited by spotted owl home range core area or old forest emphasis area protections, and are unlikely to reduce habitat quality in these zones.

Table 4.4.2.1k. Proportion of the spotted owl activity centers that occur within the urban intermix zone, by geographic area of concern.

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

D. Vegetation Treatment Effects Associated with Implementation of the HFQLG Forest Recovery Act

The high rates of vegetation treatments occurring over a short time period would result in substantial risk to the distribution and abundance of California spotted owls and owl habitat in the northern Sierra Nevada. Over a 5-year period, Alternative 2 of the HFQLG would create 43,500 acres of group selection openings, 21,375 acres of which are anticipated to occur within the Westside. An additional 222,600 acres of treatment would occur to create linear DFPZs, characterized by open overstories over open understories, with very little vertical layering. These vegetation treatments are expected to produce a 7 percent decline in suitable owl nesting habitat and a 8.5 percent decline in suitable foraging habitat (Biological Evaluation for the HFQLG Forest Recovery Act, 1999).

Implementing group selection openings will create low to moderate density openings within each stand and will create additional edge adjacent to or within suitable habitat. Implementing DFPZ treatments will maintain continuous cover but will increase the amount of contrast between treated and untreated stands and associated edge. The Biological Evaluation for the HFQLG project concluded that this alternative increased edge effects, reduced habitat connectivity, and increased habitat gaps. It was rated “low” in minimizing fragmentation.

Implementation of vegetation treatments described in Alternative 2 of the HFQLG would increase the amount of discontinuous habitat and habitat isolation through creation of further fragmentation within Areas of Concern. These actions will widen the gaps between habitat parcels and probably reduce the densities of owls. The Technical Report warned against exacerbating conditions within these areas where, “future problems may be greatest if the owl’s status were to deteriorate (Verner et al. 1992). Alternative 2 would contribute to further habitat fragmentation within three geographic areas of concern (AOCs 1, 2, and 3) where habitat is already discontinuous or naturally fragmented, or where there is little information about owl densities. Such action would be expected to decrease the density of owl pairs making successful dispersal more difficult and reducing the likelihood of rapid colonization of unoccupied habitat by owls.

5. Standards and Guidelines addressing important elements of habitat quality.

The Technical Report warned that subtle factors that uniformly decrease habitat quality would act to reduce population density and increase the uncertainties associated with successful dispersal and mate finding. The quality of available spotted owl habitat under each alternative is influenced by specific Standard and Guideline provisions for retention of important structural elements during vegetation treatments.

A. Canopy Cover and Structure

Studies have identified canopy cover and layering as stand structural characteristics associated with preferred nesting and foraging sites for the California spotted owl. Hunsaker et al. (in press) conclude that the threshold between canopy cover values that contribute to or detract from occurrence and productivity of California spotted owls is a value near 50 percent (measured through aerial photo interpretation).

Alternative 4 lacks standards addressing retention of canopy cover in any land allocation. Alternatives 1, 3, 6, and 7 have standards addressing canopy cover or basal area retention, but it is unlikely or unclear that the standards included in these alternatives will provide for maintenance of high quality habitat. Alternative 6 establishes canopy cover requirements that are applied as averages over large landscapes. The extent to which such averages (which are as low as 40 percent on most south aspects) will provide for maintenance of canopy cover and structure for high quality owl habitat is uncertain. Similarly, the effectiveness of the general forest prescription in maintaining adequate canopy conditions in Alternative 7 is highly uncertain since the frequency and distribution of group selection openings and their context in the surrounding landscape is not addressed.

Alternatives 2 and 5, provide for retention of canopy cover associated with high quality spotted owl habitat, within spotted owl home ranges and throughout the large areas encompassed by biodiversity reserves and old forest emphasis areas. Alternative 8 and Modified Alternative 8

ensure that all vegetation treatments maintain a minimum of 50 percent canopy cover, where it exists, thereby retaining owl habitat both within and outside spotted owl home ranges.

Modified Alternative 8 provides further assurances that high quality canopy structure will be maintained for spotted owl sites. This alternative prevents vegetation treatments from resulting in uniform canopy cover at the minimum threshold established by including several additional standards and guidelines. First, canopy retention guidelines set both lower limits *and* limits upon the degree of change from the existing canopy cover in the stand (limited to 10% change in old forest emphasis areas and owl home range core areas and 20% change in urban areas and the remainder of the general forest). Even after treatment, all prescriptions, except those in the defense zone, retain at least 50 percent canopy cover where it exists representing suitable, and by some standards preferred owl habitat. Second, standards and guidelines in modified alternative 8 maintain existing patches of high capability owl habitat that are greater than an acre in size (defined as CWHR 6, 5D, and 5M). Alternative 5 retains patches greater than 5 acres. Vegetation treatments are limited to removal of small diameter material in these stands. These standards help to avoid uniformity and provide for a diversity of canopy cover conditions throughout spotted owl home ranges and across the landscape as a whole.

B. Large, Old Trees

All of the alternatives retain trees greater than 30 inches dbh in westside forests and all trees greater than 24” in eastside forests. Alternatives differ, however, in the stand-level retention standards that will affect recruitment and density of large trees over time. Alternative 4 lacks specific standards requiring retention of smaller trees to provide for future recruitment of large trees. The remaining alternatives provide a mechanism for ensuring continued recruitment of large trees within treated areas. Alternatives 1 and 5 utilize CASPO basal area retention requirements, Alternative 7 relies upon CWHR strata size class retention requirements, and Alternative 8 and Modified Alternative 8 rely largely upon canopy cover retention to ensure a continuing supply of large diameter trees across the landscape. Modified Alternative 8 also has a 20-inch dbh size limit in most vegetation treatments that are designed as understory thinnings, thus specifically retaining the 20- to 30- inch size class for future recruitment of large trees. Alternatives 1, 5, and Modified Alternative 8 limit vegetation treatments in owl habitat to understory thinning prescriptions which provides recruitment of large diameter trees but may, over the longterm, impact continuing recruitment into smaller size classes.

C. Snags and Down Wood

All alternatives have standards that require retention of a number of snags greater than 15 inches in dbh in the general forest allocation. Alternatives 2, 4, 6, 8 and modified 8 require retention of the 4 largest snags per acre in mixed conifer habitat and the 6 largest snags per acre in red fir habitats. Alternatives 1, 3, and 5 require retention of at least 20 square feet of basal area in the largest snags available, up to eight snags per acre. These alternatives appear to adequately address snag retention for spotted owl foraging habitat, since they are within the range of the mean values for snag basal area reported by Verner et al. (1992). Alternative 7 does may not provide for adequate retention because it does not require retention of the largest snags available. Retention levels in other allocations such as PACs, old forest emphasis areas, and riparian areas, exceed general forest retention levels under most alternatives.

D. Retention of Duff Layer

All alternatives would meet Regional soil quality standards. An assumption is made, however, that the more areas treated with mechanical treatments, the greater the potential for disturbance of the duff layer and associated micro-habitat that may be important to spotted owl prey. Under this assumption, Alternatives 4, 7, 1, 6, 3, 5, Modified 8, 8 and 2 result in risk in descending order of magnitude.

6. Level of Natural Disturbance.**A. Change in the amount area affected by stand replacing wildfires.**

Wildfire effects, particularly those associated with large, stand replacing wildfires, are a major source of risk to spotted owl populations. Loss and degradation of habitat, creation of habitat gaps, and lengthy time periods for habitat reestablishment, are some of the impacts that may result from wildfires. Alternatives that are projected to reduce the acreage and/or intensity of wildfires would be expected to provide long-term benefits to spotted owls. Alternatives 3, 4, 6, and 7 are projected to substantially reduce wildfire acres (and especially acres of lethal mortality) over two or more decades; modified Alternative 8 is expected to maintain approximately the existing situation in wildfire acres; and wildfire acres burned are projected to increase under Alternative 8, 1, 5, and 2 (in order of increasing magnitude). An essential question is whether vegetation treatments result in a net gain or net loss of habitat over time when wildfire is factored in. The effects of vegetation treatments upon owl habitat are immediate, for the most part, and relatively easy to quantify. Reductions in the acreage and intensity of future wildfires due to vegetation treatments become apparent over longer timeframes. In addition, due to the stochastic nature of wildfire events, wildfire projections have greater amounts of uncertainty and are heavily dependent upon an array of assumptions for variables that are difficult to quantify. Tradeoffs between habitat lost through treatments versus projected losses to wildfire events are therefore complex and their implications difficult to assess for the spotted owl. However, the relatively light treatments prescribed in Modified Alternative 8, with limits of 10- to 20-percent reduction in canopy cover, will likely persist for only a short time period until ingrowth re-establishes canopy cover.

Total wildfire acreage and acreage of stand replacing wildfires decreases most dramatically under alternatives 3, 4, 6 and 7, from about 62,000 acres currently to less than 55,000 acres projected to annually at the fifth decade. Under Modified Alternative 8, the average annual acres burned in wildfire is projected to remain about constant with current levels over 50 years. The average annual acreage of stand replacing wildlife increases slightly, from about 15,000 acres to about 17,000 acres projected annually at the fifth decade under Modified 8. In the remaining alternatives, projected annual acres of wildfire increase over the 50-year timeframe, with the highest increase projected for Alternative 2 (from about 62,000 acres to about 76,000 projected annually at the fifth decade).

Given the owl's declining population status, net gains or losses of habitat must be evaluated over short (one to two decades) as well as longer time frames. Shorter-term projections, where the magnitude of change is less influenced by modeling assumptions, may also have lower levels of uncertainty associated with them. Table 4.4.2.11 displays the total acres affected from both fuels treatments *and* wildfire over the next two decades by adding the total acres of projected wildfire to the acres of vegetation treatments that are unlikely to maintain important spotted owl habitat elements (shown in Table 4.4.2.1i). Based on this comparison, Modified Alternative 8 represents the lowest risk to declining habitat over the first two decades, followed

by alternatives 3, 8, 6 and 5 in increasing order of risk. Alternatives 1, 4, and 7 will do less to maintain available habitat over the first two decades, as a tradeoff for greater projected increases in habitat 50 years in the future.

Table 4.4.2.11. Total of the projected annual acres of wildfire burned and the estimated annual acres of higher intensity vegetation treatments* (in thousands).

	Annual Acres of Wildfire and Treatment (in thousands)								
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Mod 8
First Decade	93	70	73	89	73	73	86	70	65
Second Decade	88	69	60	80	71	66	82	67	59
Average over Two Decades	90.5	69.0	66.5	84.5	72.0	69.5	84.0	68.5	62.0

*higher intensity vegetation treatments" defined as modeled treatment prescriptions 45 and higher.

B. Change in the amount of area affected by stand replacing wildfire following implementation of the HFQLG Forest Recovery Act.

Reduced wildfire acres would be expected if forests were to implement Alternative 2 of the HFQLG Forest Recovery Act EIS. Benefits are expected, but their magnitude remains uncertain. Tradeoffs associated with habitat reductions over the short-term, five-year period, also appear to be substantial (previously described).

7. Cumulative Effects

About 2.4 million acres of private lands occur within the Sierra Nevada; of this, about 1.45 million acres are owned and managed as industrial forests, primarily at mid-elevations in the mixed-conifer forest type. National Forests in the Sierra Nevada include approximately 1.4 million acres of private land within their administrative boundaries. Private land inholdings are much greater in extent in the northern National Forests (especially the Lassen, Plumas, and Tahoe) than in the southern Sierra Nevada forests. Much of the private land within the boundary of the Lassen and Plumas National Forests tends to be in contiguous blocks, leaving National Forest lands also fairly contiguous. Most private land on the Tahoe National Forest is in checkerboard ownership, and the Eldorado National Forest has a combination of checkerboard ownership and large contiguous blocks of inholdings. The Sierra and Sequoia have little private land within their administrative boundaries and the four National Parks have negligible amounts.

Industrial forestlands are managed to produce a long-term sustained yield of forest products, primarily saw logs. Management of industrial forest land in California is governed by the forest practice rules of the Z'berg-Nejedly Forest Practices Act, which includes specific requirements for (and restrictions on) aspects of forest management, including the size of clearcut, the tree stocking levels after harvest, protection of wildlife habitat, retention of old growth, etc. These rules also require management of private forests for long-term sustained yield and require preparation and approval of timber harvest plans before logging operations may commence. The Forest practice rules provide protection measures for active nest sites and for late successional forest stands. The size of nest stand buffers is not specified but is designed to protect the immediate nest site and nesting birds from effects of timber operations. Forest practices rules do not establish requirements for maintaining amounts of foraging habitat for owl sites. Management activities planned under the Forest Practices rules do not, therefore, provide assurance that activities will retain the amount and quality of habitat expected to

maintain spotted owl occupancy or productivity (Bart, 1995, Hunsaker et al. in press, Verner et al. 1992).

The Petition to List the California spotted owl as a Threatened or Endangered Species (Center for Biological Diversity, Sierra Nevada Forest Protection Campaign, April 2000) reported a total of 299,421 acres of private land timber harvest planned within two miles of known spotted owl sites, based on a review of timber harvest planning documents. Timber harvest on private lands has been and will continue to be a major source of cumulative impact upon spotted owl habitat in the Sierra Nevada. Under current Forest Practices rules, it is assumed that spotted owl habitat on private lands will continue to decline. Since there are few assurances of habitat protection on private lands, analysis of the Alternatives in this EIS does not assume that private lands will continue to contribute habitat to spotted owl sites occurring on National Forest lands. Owl home range habitat requirements under Alternatives 2, 5, 8 and Modified 8 are implemented under this assumption, thereby addressing cumulative impacts to the extent possible. Alternatives 1, 3, 4, 6, and 7, do not provide a specific mechanism that compensates for declining habitat conditions on private lands.

Human population growth and development in the Sierra Nevada is projected to increase substantially over the next few decades. While human development has not been identified as a major source of cumulative impact to date, impacts related to increased urbanization, infrastructure development, and recreation, are likely to increase over time.

8. Environmental Outcomes

This section synthesizes the discussion of environmental consequences to arrive at an estimate of the environmental and population conditions that would exist in 50 years for the California spotted owl, under each alternative. The environmental outcomes address habitat distribution and its anticipated consequence to species dispersal and interaction capabilities. Population outcomes factor in the availability of both federal and non-federal habitat and other influences on the spotted owl population that are not accounted for in the environmental outcomes. Assigning these outcomes is inherently subjective, although based on a reasoned thought process and the best available information. Table 4.4.2.1k presents environmental and population assessment ratings for the California spotted owl. These ratings assume implementation of Framework alternatives over the next 50 years, across all forests of the Sierra Nevada, including those forests addressed in the HFQLF Forest Recovery Act). Part 4.1.5 of this chapter provides more detailed descriptions of the five possible outcomes; these outcomes are briefly summarized below Table 4.4.2.1m for the reader's convenience.

Table 4.4.2.1m. Environmental outcome ratings for the California spotted owl. Ratings other than “current” represent the outcome most likely to be realized 50 years in the future. (See Chapter 4, Part 4.1.5.)

Alternative	Outcomes	
	Environmental	Population
Current	B	B
1	C	D+
2	C+	C-
3	B-	C
4	C	D+
5	B	C+
6	B-	C
7	C	D+
8	B+	B-
Mod 8	A-	B

Outcome A. Suitable environments are broadly distributed and of high abundance across the range of the species.

Outcome B. Suitable environments are either broadly distributed or of high abundance across the range of the species; however, there are temporary gaps where suitable environments are absent or only present in low abundance. Disjunct areas of suitable environments are typically large enough and close enough to permit dispersal and interaction among subpopulations across the species' range.

Outcome C. Suitable environments are frequently distributed as patches or they exist at low abundance, or both. Gaps, where suitable environments are either absent or present in low abundance, are large enough that some subpopulations are isolated, limiting opportunity for species interactions. In most of the species range, subpopulations have the opportunity to interact as a metapopulation; however, some subpopulations are so disjunct or of such low density that they are essentially isolated from other populations.

Outcome D. Suitable environments are highly isolated or they exist at very low abundance, or both. While some subpopulations associated with these environments may be self-sustaining, there is limited or no opportunity for population interaction. There has likely been a reduction in overall species range from historical conditions, except for some rare, local endemics that may have persisted in this condition since the historical period.

Outcome E. Suitable environments are highly isolated and exist at very low abundance. Populations have little or no interaction, resulting in strong potential for local or regional extirpation, and low likelihood of recolonization.

Rationale for Ratings

The distribution of California spotted owls is currently nearly continuous throughout their range within the Sierra Nevada. However, the declining population trends reported from demographic studies suggest that current habitat conditions are not fully sustaining this distribution. Consequently, the current status of conditions for owls is judged to be primarily well distributed with gaps, allowing operation of metapopulation processes (Outcome B), but that there is some likelihood that existing conditions would result in permanent isolation of some portion of the population (Outcome C).

The following criteria were developed and applied to each alternative to arrive at environmental outcomes: (1) CWHR habitat projections, (2) Standards and Guidelines providing for sufficient amounts and distribution of high quality habitat at landscape and home range scales; and (3) Standards and Guidelines addressing stand-level structure and important habitat elements.

CWHR habitat projections, provide the most synthesized description of environmental conditions in 50 years because their modeling integrates treatment effects, wildfire and other mortality effects, and tree growth effects, into the projection of vegetative conditions. The variability surrounding these projections is high, however, since the results are dependent on assumptions made for a large number of variables, each with varying degrees of certainty, and for which uncertainty is high in many cases. Lower confidence is provided as projections are made further into the future. Additional uncertainty is added because assessment of habitat through a broad vegetation classification system, such as CWHR, invariably miss or allow for

misinterpretation of subtle changes in habitat quality that may be important to maintaining productivity of owl sites. (For example, the use of stand averages to evaluate changes in habitat quality can, in some instances, be misleading, as when understory treatments increase the average size class of the stand, yet do not result in a real increase in habitat suitability). Taking these uncertainties, as well as the absence of spatial considerations in CWHR projections, into account, outcomes were judged by considering the two additional criteria. These criteria are intended to provide greater certainty about the quality and distribution of projected habitat.

To arrive at population outcomes, the following criteria were developed and their influence upon the environmental outcomes for each alternative was considered: (1) documented population trends; (2) timber harvest on private lands; and (3) human population growth and development.

Modeling showed all alternatives providing increasing amounts of habitat over 50 years, with greater amounts occurring under alternatives 3, 6, Modified 8 and 8 and slightly lower amounts under alternatives 2, 7, 4, and 1. The magnitude of differences between the alternatives is difficult to interpret with confidence due to variation inherent in the vegetation information and modeling process. The basis for differing environmental outcomes among the alternatives is primarily based upon criteria 2 and 3. The following discussion summarizes findings from the environmental consequences section that influence the environmental outcomes.

Alternative 1: The abundance and distribution of suitable environments for the spotted owl is expected to decline from current conditions, with increased likelihood of population isolation, for the following reasons:

- Alternative 1 lacks provisions addressing the distribution of habitat within owl home ranges, sufficient to maintain occupancy and productivity of spotted owl sites.
- Alternative 1 lacks provisions ensuring adequate retention of important structural elements of owl habitat, particularly canopy cover and layering, during vegetation treatments (except within the relatively few acres occurring in PACs).
- Ninety-six percent of owl activity centers occur in allocations where more intensive vegetation treatments are permitted occur.

The factors listed above result in uncertainty about the future quality of habitat that would be provided within owl home ranges under Alternatives 1. Currently, suitable environments are estimated to occur in approximately half of the spotted owl home ranges in the Sierra Nevada (considering results reported in Hunsaker et al. *in press*); there is a likelihood that this proportion would decrease under Alternative 1. Alternative 1 has the potential to result in subtle but uniform decreases in habitat quality across the owl's range (changes that may not be readily displayed by CWHR habitat projections). Given current range-wide conditions, disproportionate impacts would be anticipated within geographic areas of concern, where, if suitable environments decline, they may become absent or remain present only in low abundance. Habitat projections under alternative 1 do not benefit from decreasing amounts of wildfire; total wildfire acres and high intensity wildfire acres are anticipated to increase from current levels under this alternative. Given these considerations, suitable environments for productive owl sites are estimated to become patchy or unevenly distributed under Alternative 1 and may be reduced to low abundance, particularly within certain geographic areas of

concern. Spotted owl population outcomes in 50 years are rated at outcome D, given current population trend estimates and assuming continuation of current levels of timber harvest on industrial timberlands across the Sierra Nevada.

Alternative 2: The abundance and distribution of suitable environments for the spotted owl is expected to decline from current conditions, with increased likelihood of population isolation, for the following reason:

- Wildfire rates (and particularly acres of high-intensity wildfire) are expected to increase substantially under Alternative 2, approaching levels under a “no vegetation treatment” scenario.

Alternative 2 provides a high degree of certainty that vegetation treatments will not adversely affect the distribution or abundance of owl habitat since less than 15 percent of owl activity centers occur in land allocations where more intensive vegetation treatments are permitted occur. Even where owl sites occur outside of large biodiversity reserves, standards and guidelines address the distribution of high quality habitat within owl home ranges. Alternative 2 does not, however, reduce the risk and uncertainty associated with wildfire. Suitable environments for productive owl sites may be reduced to low abundance in certain areas, due to increasing acreage of high-intensity wildfire projected. Spotted owl population outcomes in 50 years are rated at outcome C-, given current population trend estimates and assuming continuation of current levels of timber harvest on industrial timberlands across the Sierra Nevada.

Alternative 3: The abundance and distribution of suitable environments for the spotted owl is expected to remain about the same or decline slightly from current conditions for the following reasons:

- Alternative 3 lacks provisions addressing the distribution of habitat within owl home ranges, sufficient to maintain occupancy and productivity of spotted owl sites..
- Alternative 3 lacks provisions ensuring retention of important structural elements of owl habitat, particularly canopy cover and layering, during vegetation treatments (except within the relatively few acres occurring in PACs).
- Forty-six percent of owl activity centers occur in allocations where more intensive vegetation treatments are permitted occur.

Alternative 3 does not include provisions addressing habitat distribution within spotted owl home range areas and does not provide specific standards for retention of structural elements of owl habitat such as canopy cover and structure. These risks are offset, somewhat, by a substantial reduction in wildfire acres estimated under Alternative 3. Alternative 3 does not ensure retention of canopy cover and structure during vegetation treatments. Lack of specificity regarding vegetation treatments in this alternative, increases the uncertainty of effects relative to other alternatives. Since less than 50 percent of spotted owl activity centers occur within land allocations where more intensive vegetation treatments are permitted to occur, treatments are less likely to result in uniform decreases in habitat quality across the owl's range. Habitat is expected to remain broadly distributed but gaps, where suitable environments are present in low abundance, are likely to increase as a result of vegetation treatments, particularly within geographic areas of concern. Spotted owl population outcomes

in 50 years are rated at outcome C, given current population trend estimates and assuming continuation of current levels of timber harvest on industrial timberlands across the Sierra Nevada.

Alternative 4: The abundance and distribution of suitable environments for the spotted owl is expected to decline from current conditions for the following reasons:

- Alternative 4 lacks provisions addressing the distribution of habitat within owl home ranges, sufficient to maintain occupancy and productivity of spotted owl sites..
- Alternative 4 lacks provisions ensuring retention of important structural elements of owl habitat, particularly canopy cover and layering, during vegetation treatments (except within the relatively few acres occurring in PACs).
- Ninety-six percent of owl activity centers occur in allocations where more intensive vegetation treatments are permitted to occur.

The factors listed above result in uncertainty about the future quality of habitat that would be provided within owl home ranges. Habitat projections under alternatives 4 benefit from reductions in the acreage of wildfire and stand-replacing wildfire 50 years into the future. Canopy cover retention requirements in alternative 4 are limited to the retention of 30 inch trees; they do not provide for maintenance of high quality owl habitat outside of PACs. The treatment prescriptions modeled typically retain more than 30 inch trees, but, in the absence of specific standards and guidelines, the certainty that actual treatments will resemble the prescriptions modeled is lowered. This reduces the confidence with which one can interpret CWHR projections for alternative 4. Nonetheless, modeled treatments under Alternative 4 include average annual treatment of about 29,000 acres with heavy thinning, group selections, seed tree, or regeneration harvest across the Sierra Nevada. These treatments have greater potential for increasing fragmentation of suitable environments, and isolating patches of suitable habitat. The synergistic impacts associated with habitat fragmentation and edge effects is likely exceed impacts displayed by habitat projections alone. Given current range-wide conditions, disproportionate impacts would be anticipated within geographic areas of concern, where, if suitable environments decline, they may become absent or remain present only in low abundance. Spotted owl population outcomes in 50 years are rated at outcome D, given current population trend estimates and assuming continuation of current levels of timber harvest on industrial timberlands across the Sierra Nevada.

Alternative 5: The abundance and distribution of suitable environments for the spotted owl is expected to remain about the same as current conditions for the following reasons:

- Alternative 5 includes provisions addressing the distribution of habitat within owl home ranges, providing a higher probability of maintaining occupancy and productivity of spotted owl sites.
- Alternative 5 includes provisions ensuring retention of important structural elements of owl habitat, particularly canopy cover and layering, within old forest emphasis areas and within spotted owl home ranges in the general forest.
- Only 33 percent of owl activity centers occur in allocations where more intensive vegetation treatments are permitted to occur.

Considering these factors, Alternative 5 provides a higher degree of certainty that vegetation treatments will not adversely affect the distribution or abundance of owl habitat over the next 50 years. Habitat objectives applied to individual owl sites would increase the likelihood of maintaining owl sites that occur within fragmented landscapes and other geographic areas of concern. Environments supporting productive owl sites are expected to remain broadly distributed and to be maintained in abundance across the range of the species; increases in temporary gaps may result from wildfire, however. Spotted owl population outcomes in 50 years are rated at outcome C, based upon current population trend estimates and assuming continuation of current levels of timber harvest on industrial timberlands across the Sierra Nevada.

Alternative 6: The abundance and distribution of suitable environments for the spotted owl is expected to remain about the same or decline slightly from current conditions for the following reasons:

- Alternative 6 lacks provisions addressing the distribution of habitat within owl home ranges, sufficient to maintain occupancy and productivity of spotted owl sites.
- Alternative 6 lacks provisions ensuring retention of important structural elements of owl habitat, particularly adequate canopy cover and layering, during vegetation treatments (except within the relatively few acres occurring in PACs).
- Sixty-four percent of owl activity centers occur in allocations where more intensive vegetation treatments are permitted occur.

Alternative 6 does not include provisions addressing habitat distribution within spotted owl home range areas. Alternative 6 has requirements for canopy cover retention averaged across large landscape areas, but it is unclear that such requirements will provide for maintenance of high quality habitat. Alternative 6 may result in more uniform decreases in habitat quality across the owl's range, at least across south and west aspects. Habitat projections under alternatives 6 benefit from projected reductions in the acreage of wildfire and stand-replacing wildfire 50 years into the future. Suitable environments for productive owl sites are expected to remain broadly distributed but gaps, where suitable environments are present in low abundance, are likely to increase as a result of vegetation treatments, particularly within geographic areas of concern. Spotted owl population outcomes in 50 years are rated at outcome C, given current population trend estimates and assuming continuation of current levels of timber harvest on industrial timberlands across the Sierra Nevada.

Alternative 7: The abundance and distribution of suitable environments for the spotted owl is expected to decline from current conditions for the following reasons:

- Alternative 7 lacks provisions addressing the distribution of habitat within owl home ranges, sufficient to maintain occupancy and productivity of spotted owl sites.
- Alternative 7 lacks provisions for retention of important structural elements of owl habitat, particularly canopy cover and layering, during vegetation treatments (except within the relatively few acres occurring in PACs).
- Ninety-six percent of owl activity centers occur in allocations where more intensive vegetation treatments are permitted to occur.

The above factors result in uncertainty about the future quality of habitat that would be provided within owl home ranges under Alternative 7. Habitat projections benefit from reductions in the acreage of wildfire and stand-replacing wildfire 50 years into the future. The large number of owl sites allocated to general forest and the lack of specific standards for retention of structural elements of owl habitat such as canopy cover and structure, result in considerable uncertainty about future habitat conditions. Modeled treatments under Alternative 7 include average annual treatment of about 25,000 acres with heavy thinning, group selections, seed tree, or regeneration harvest across the Sierra Nevada. These treatments have greater potential for increasing fragmentation of suitable environments, and isolating patches of suitable habitat. Given current range-wide conditions, disproportionate impacts would be anticipated within geographic areas of concern, where, if suitable environments decline, they may become absent or remain present only in low abundance. Spotted owl population outcomes in 50 years are rated at outcome D+, given current population trend estimates and assuming continuation of current levels of timber harvest on industrial timberlands across the Sierra Nevada.

Alternative 8: The abundance and distribution of suitable environments for the spotted owl is expected to remain about the same or increase slightly from current conditions for the following reasons:

- Alternative 8 includes provisions requiring retention of existing suitable habitat both within and outside of known owl home ranges, providing a higher probability of maintaining occupancy and productivity of spotted owl sites.
- Alternative 8 includes provisions ensuring retention of important structural elements of owl habitat, particularly canopy cover and layering, within spotted owl habitat.
- Forty-two percent of owl activity centers occur in allocations where more intensive vegetation treatments are permitted to occur.

Considering these factors, Alternative 8 provides a higher degree of certainty that vegetation treatments will not adversely affect the distribution or abundance of owl habitat over the next 50 years. Alternative 8 lacks habitat objectives applied to individual owl sites but, instead, relies upon retention of existing suitable habitat across the species range. Lack of habitat objectives reduces the likelihood that habitat conditions will improve within those owl home ranges that currently provide less than suitable environments for occupancy and productivity. This issue would be of greatest concern within fragmented landscapes and other geographic areas of concern where a high proportion of owl sites currently lack suitable conditions. Environments supporting productive owl sites are expected to remain broadly distributed and to be maintained in abundance across the range of the species; increases in temporary gaps may result from wildfire, however. The retention of currently suitable but unoccupied habitat in this alternative may be important for maintaining well distributed habitat into the future. Spotted owl population outcomes in 50 years are rated at outcome B, based upon current population trend estimates and assuming continuation of current levels of timber harvest on industrial timberlands across the Sierra Nevada.

Modified Alternative 8: The abundance and distribution of suitable environments for the spotted owl is expected to increase above current conditions for the following reasons:

- Modified Alternative 8 includes provisions addressing the distribution of habitat within owl home range core areas, providing a higher probability of maintaining occupancy and productivity of spotted owl sites.
- Modified alternative 8 includes provisions ensuring retention of important structural elements of owl habitat, particularly canopy cover and layering, across all portions of the landscape except urban core areas.
- Fifty-one percent of owl activity centers occur in allocations where more intensive vegetation treatments are permitted to occur.

Considering these factors, Modified Alternative 8 provides a higher degree of certainty that vegetation treatments will not adversely affect the distribution or abundance of owl habitat over the next 50 years. Modified Alternative 8 addresses habitat both within known owl home ranges, and across the landscape as a whole. Importantly, Modified Alternative 8 includes several provisions that ensure vegetation treatments will not result in subtle but uniform decreases in habitat quality across the owl's range: (1) protection of existing patches of high quality owl habitat across all land allocations, (2) limitations on the amount of change from existing canopy cover conditions (avoiding the potential for uniform canopy cover reductions to a minimum threshold level), and (3) limited habitat alteration within spotted owl home range core areas in the general forest, and within old forest emphasis areas which support about 50 percent of owl sites. Since Modified alternative 8 includes requirements for minimum canopy cover retention across the landscape, increases in the abundance of suitable environments for spotted owls are likely both within and outside of known owl home ranges. This provision increases the likelihood of maintaining owl sites that occur within fragmented landscapes and other geographic areas of concern where maintenance of suitable but unoccupied habitat will improve the opportunity for successful dispersal and optimum use of available habitat. Environments supporting productive owl sites are expected to remain broadly distributed and increasing abundance of suitable environments for the owl should provide opportunity for continuous or nearly continuous intraspecific interactions. The acreage of wildfire is projected to remain about the same as current levels under Modified Alternative 8. Spotted owl population outcomes in 50 years are rated at outcome B, based upon current population trend estimates and assuming continuation of current levels of timber harvest on industrial timberlands across the Sierra Nevada.

9. Areas of Uncertainty

1. The potential benefits of treating PACs with prescribed fire and/or mechanical thinning to reduce the probability for stand-replacing wildfires versus their potential positive or negative effects on California spotted owl occupancy, reproduction, and survival, remains as a major item of uncertainty in this assessment. Related to this concern is uncertainty about the degree to which specific treatments (e.g., mechanical thinning versus prescribed fire) change fire risk (e.g., reduction in surface fuel loads versus reduction small tree density). A commitment to conducting a paired study monitoring spotted owl occupancy and reproductive success associated with treated and untreated PACs, is needed to address this continuing uncertainty.
2. Uncertainty remains regarding the effects of vegetation treatments on prey biomass and availability, and on owl foraging habitat suitability. Knowledgeable evaluation of how each of the different vegetation management treatments (e.g., mechanical thinning, prescribed fire, CASPO harvest, etc.) affects the distribution, abundance, and availability of prey to California spotted owls, will require additional study. The Technical Report identified the need to

evaluate spotted owl response to various vegetation treatments. This remains an essential component of any adaptive management strategy associated with management of California spotted owl habitat. A well designed study, investigating owl habitat use in stands affected by varying types of treatments, is needed to address this continuing uncertainty.

3. Understanding where treatments will occur on the landscape is hampered by the fact that the majority of actual decisions will be determined based on local landscape or watershed analyses. Modeling in this assessment has been unable to predict spatial outcomes with any degree of certainty. It is therefore important that a tracking and monitoring mechanism be put in place which will allow for cumulatively assessing the impacts of vegetation treatments over time.

4. Uncertainty exists regarding how the distribution and abundance of habitat at landscape or regional spatial scales affects the number and distribution of owl territories across the landscape and connectivity and dispersal among territories. Understanding these dynamics is important because research on population dynamics at larger scales has suggested the possible existence of habitat thresholds, below which populations may go extinct in the presence of suitable habitat due to constraints on successful dispersal. These concerns are particularly relevant to species such as California spotted owls because of their low fecundity, indicating that populations may require long time periods to recover from low population sizes, and because of the long time periods required to develop the large old trees and late-seral forest stands that comprise owl habitat. Eventually a comprehensive conservation strategy may need to specify guidelines identifying a target number and distribution of spotted owl sites at the Forest, region, and Sierra Nevada scales.