

4.2. Vertebrate Species

4.2.1. Broad-Scale Trends in Vertebrate Species

Vertebrate species fall into four major taxonomic groups: mammals, birds, amphibians, and reptiles, all of which inhabit a wide range of environments. For purposes of this analysis, species associated with upland and riparian terrestrial environments are analyzed separately from aquatic species that spend all or most of their lives in water.

Part 3.1, “Landscape Patterns and Vegetation Dynamics,” of this chapter describes broad-scale changes in forest composition and structure under each alternative. The primary indicators of structural change are average tree size and canopy closure. The dominant vegetation reflected by these structural metrics is an important, but not isolated, component of an interdependent community of plants and animals. Structural shifts in forest vegetation can influence corresponding changes in other species that make their home among the rich diversity of forest habitats and microclimates. Examining broad-scale or aggregate trends in forest vegetation can reveal potential changes in multiple species and species groups, notwithstanding fine-scale habitat features of equal importance.

Examining vegetative change from the perspective of vertebrate species that inhabit these forests enriches our ability to view forest dynamics from a more complete ecosystem perspective. The CWHR system was designed for this purpose and allows comprehensive, range-wide looks at multiple combinations of vertebrate species and vegetation classes. When examined collectively, these combinations provide a unique opportunity to understand differences and similarities among the alternatives, and also to explore the interplay between vertebrate communities and vegetation dynamics. In this section, an aggregate analysis of 450 mammal, bird, amphibian, and reptile species is presented. The purpose of this analysis is to understand larger ecosystem dynamics and how differences might emerge among the alternatives. It is not the intent here to suggest how individual species might respond to the alternatives—such issues are addressed in considerable detail in following sections.

Measures Used to Assess Trends in Terrestrial Vertebrate Species

This analysis focused on native bird, mammal, amphibian, and reptile species found in the planning area that have positive associations with the habitat types and structural stages included in existing broad-scale vegetation maps. Additional analyses were conducted of species associated with the forest vegetation that was modeled in future projections (see Appendices B and R regarding vegetation modeling).

Information from four principal sources was used in this analysis. First, species’ range maps that were developed previously as part of the CWHR system were updated by the Sierra Province Monitoring Team and made available in digital format. These maps were available for 471 species whose current ranges all or partially overlap with the planning area. For amphibians (31 species), reptiles (53 species), and mammals (135 species), there is a single map showing the year-round distribution of the species. Since many bird species migrate seasonally and use different habitats depending on season, many of the bird species have two maps, denoting summer and winter distributions. Of the 252 Sierra Nevada bird species, 138 species have different summer and winter distribution maps, each overlapping the planning area to varying degrees. Each of these species were included as two separate taxa (i.e., summer and winter). The remainder (114 birds) have either a single, year-round distribution map, or are migrants that spend only one season within the planning

area. In total, there were 609 taxa (471+138) considered in the analysis by virtue of their distribution. In order to combine these range maps with other data, range maps were overlain with a map of planning watersheds (ca. 5,00 to 15,000 acres each), and each watershed attributed with each species' presence or absence based on the intersection of the two layers.

The second principal source of information was the vegetation maps and FIA inventory data made available by the Region 5 Remote Sensing Laboratory (RSL). These data allowed for the creation of a spatially explicit estimate of coarse-scale features of vegetation composition and structure across the planning area, including adjacent lands beyond the boundaries of the national forests. The RSL "Existing Vegetation" map assigns vegetation polygons (i.e., stands) to over 30 major vegetation types, 6 size classes, and 4 canopy closure classes, consistent with the CWHR vegetation typing scheme and based on satellite photography. The FIA inventory system augments these remotely sensed data with plot data taken from field measurements. For our analysis, we created a hybrid vegetation database in which structural attributes (i.e., size and canopy-closure class) were probabilistically assigned to the major forest types (i.e., tree dominated types) based on the FIA data gathered within each vegetation strata, rather than using the polygon label directly. Non-forest type labels (e.g., grass, shrubs, and chaparral) were used directly. The probabilistic assignment for forests was done at the scale of a planning watershed divided into ownership and vegetation-type classes, such that the results is a tabular listing of the (expected) number of acres in each structural class for each watershed/ownership/vegetation-type combination.

The third element of our analysis was the results of the vegetation projections for each alternative compiled using the Spectrum model and supporting analyses and models. The vegetation projections provide decadal estimates of the number of acres expected in each structural class by national forest and major forest type, for each alternative. Unlike the existing vegetation estimates (component 2 above), these projections apply only to forested lands on the national forests. Thus, they represent only a subset of the available habitat. Their utility is therefore limited to comparing the effects of the alternatives on a particular subset of the available habitat in the planning area.

The fourth and final source of information for our analysis was the species-habitat relationships defined within the CWHR system. For each vegetation type and structural stage combination, the CWHR system provides a relative measure of habitat value for each species, assessed in terms of supporting foraging and reproduction and providing cover from predation or environmental stress. A composite habitat utility index was created from this information that varies from zero to one, with one being a "high" value for all three components: foraging, reproduction, and cover. An aggregate measure of habitat quantity and quality can be calculated by multiplying the number of acres of each habitat combination by its respective habitat utility for each species. These habitat utilities can then be summed across species and spatial aggregations of habitat to allow relative comparisons.

Habitat utility indices were calculated for each of the 609 taxa represented in the set of available range maps. Range maps were combined with the hybrid existing vegetation database to estimate amounts and distribution of available habitat within the range of each species. The CWHR relationships were then used to assign utility values to each habitat component. An equivalent procedure was used with the vegetation projections to estimate future levels of habitat utility for 315 species that were judged more likely to be affected by changes in forested conditions.

Methodology for Assessing Terrestrial Vertebrate Species, including Assumptions and Limitations

The methods used to examine broad-scale patterns in vertebrate species utilize the types and quality of available data to provide a rational, empirical basis for comparison. There are natural limitations in inferences to be drawn, however, because of the complex nature of the interactions between wildlife species and habitat. We cannot claim unequivocally that either the absolute value of a habitat utility measure or trends in such measures directly correlate to population abundance or expected changes in population size. The species-specific accounts in this document attest to a variety of factors that contribute to possible incongruence. A common mismatch is that the vegetation mapping used herein is at the wrong scale or characterizes features that are not the driving factors influencing population dynamics. An additional caveat is that the modeling techniques used simulate changes in forest structure only, not changes in vegetation type or fine-scale attributes. To the extent that we recognized such shortcomings, we excluded certain species from various phases of analysis or refrained from commenting on possible outcomes for these species based on coarse habitat measures.

There is value in considering as many species and habitats as possible, even when the link between habitat and population dynamics is tenuous. It is informative to know that a certain habitat type is used by multiple species, even if it is not the optimal habitat for most. In a natural landscape mosaic, large contiguous blocks of optimal habitat are rare. More commonly, the best habitat exists in clumps of various sizes distributed in a larger matrix of less suitable and even unusable habitats. The suboptimal but useable habitats may be critical to maintaining population connectivity and harboring surplus individuals in productive years. Knowing the complete range of species that uses a particular habitat and the extent to which they use it is necessary to gain a fuller appreciation of habitat value.

The combination of species range maps, vegetation maps, and CWHR relationships provide a richness of data and information that cannot be fully explored in this document. It is possible, for example, to generate spatially explicit maps of habitat quality for each taxa. Historical range maps are also available for all species, allowing one to evaluate the potential for expansion into formerly occupied areas. This type of information will be summarized in future documents and made available for project implementation and future planning. Our analysis here is focused on summarizing across species as succinctly as possible, or focusing on specific species that are judged to be at risk.

For any particular biome or geographic area, one approach to looking at species collectively is to group species based on habitat use and availability. Four classes seem logical: habitat specialists, area occasionals, habitat generalists, and habitat selectives. The first two classes, specialists and occasionals, overlap in that both classes include species with relatively limited amounts of suitable habitat within the planning or assessment area. Area occasionals are species that are more commonly found in lower elevation habitats outside the planning area, but also can be found occasionally at higher elevations. Examples include the American crow, northern harrier, and desert cottontail. In contrast to occasionals, true habitat specialists use a small subset of available habitats exclusively. Such habitats can be naturally rare, or as is the case for many species here, preferred habitats are found in small patches that are overlooked in the vegetation mapping for this analysis. For example, most riparian or wetland dependent species are under-represented in our analyses because riparian habitats are so poorly mapped at the range-wide scale. Our methods reflect the extent to which riparian species venture into more upland environments and track management effects on those environments, not on the key wetland or riparian habits themselves.

At the other end of the spectrum from the specialists and occasionals are the habitat generalists. These species are found in a wide variety of broad-scale habitats and thus have large habitat utility values. Examples of generalists include the common raven, yellow-pine chipmunk, and yellow-rumped warbler. Distributed somewhere between the generalists and the specialists and occasionals are species with intermediate levels of habitat units. These species include many of the species that are widely distributed among Sierra Nevada national forests, and indeed much of North America, but they are more selective than the true habitat generalists in their use of habitats. For lack of a better term, this group of species is referred to as simply habitat selectives.

In any analysis involving numerous observations and variable, statistics and graphics play an important role in conveying information. To describe existing conditions, we generally used aggregate habitat utility scores across multiple taxa. When comparing alternatives, we used a multivariate clustering technique (SAS Institute 1989) that creates linear combinations of species' scores such that most of the overall variation is retained in a smaller set of composite indexes. These indices are then used to project habitat trends for various groups of species, either across the entire planning area or within major vegetation types. At the individual species level, habitat utility values currently and in future decades were expressed in both absolute and relative terms. Generally, comparisons among species are based on absolute units, while group-specific comparisons between alternatives are expressed in relative terms.

I. Affected Environment

The 11 national forests and the adjacent lands within the larger planning area encompass 17.8 million acres of vegetation that can be classified within the CWHR system (Table 4.2.1a.). For simplicity, the more than 30 distinct vegetation types were aggregated into 12 vegetation classes. Similarly, lands were grouped into four ownership classes. Adjacent lands in Nevada, and Yosemite and Sequoia-Kings Canyon National Parks in California are the only major blocks not included in these totals. Habitat utility values were calculated based on these habitat estimates for 609 taxa. Of these, 31 taxa (representing 29 species) had no positive associations with the mapped habitat types. Habitat utility values were summarized across the remaining 578 taxa by major vegetation types and ownership class.

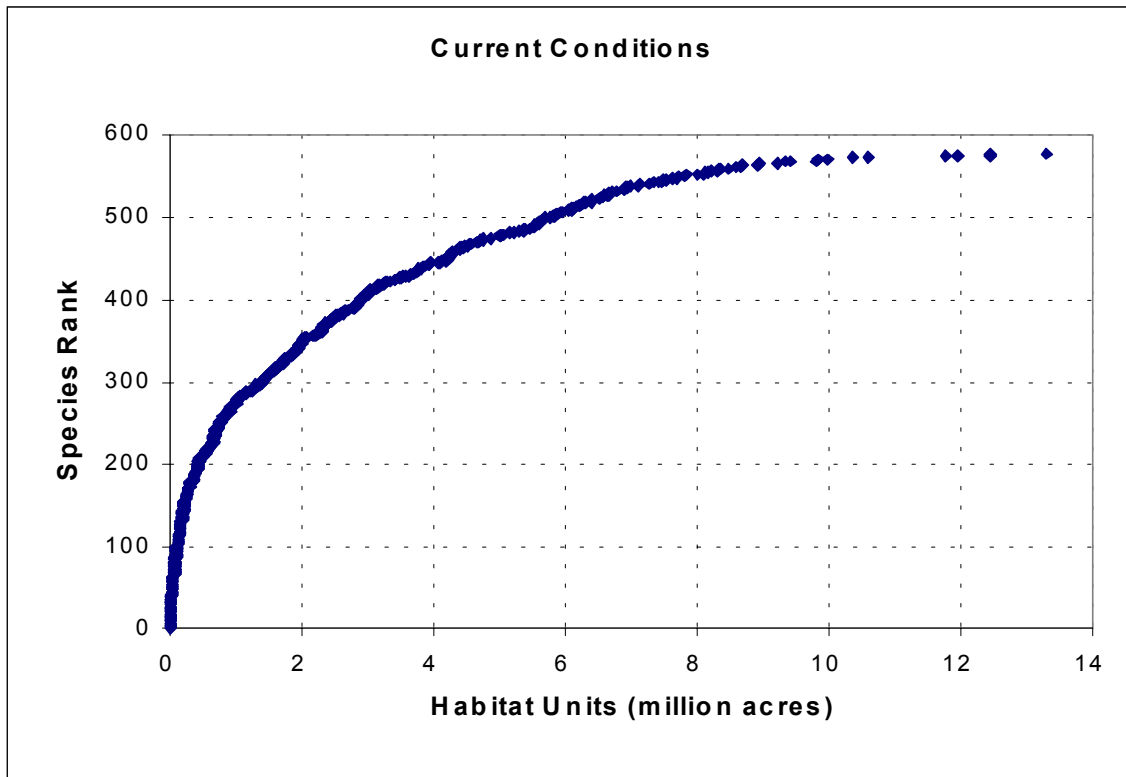
The absolute magnitudes of the summed habitat utility values mean very little. What is more important is the relative contribution of each vegetation and ownership class to the total, relative to the proportional area within each class. A habitat ratio was calculated for each class by dividing the percentage of the total habitat utility by the percentage of the total area (Table 4.2.1a.). A ratio of 1.0 indicates that the summed habitat utility is directly proportional to the area occupied. Higher ratios suggest a higher habitat utility per unit area. Based on estimates of current habitat conditions, hardwood and ponderosa pine forests have the highest per unit habitat utilities, while grasslands (including some agricultural types) and the upper-elevation subalpine conifer forests have the lowest values. Similarly, national forests outside of wilderness areas have the highest per unit utility, while wilderness areas—with their association with high elevations—have the lowest values.

Table 4.2.1a. Aggregate habitat utility values summed over 578 taxa, by major vegetation type and ownership class, compared to aerial extent of each grouping.

	Aggregate Habitat Value (millions)	Percent of Total Habitat	Aerial Extent (acres)	Percent of Area	Habitat Ratio
Major Vegetation Type					
Wetlands	24	1.8%	280,000	1.6%	1.14
Grasslands	48	3.6%	1,180,000	6.6%	0.55
Shrubs	239	18.0%	3,630,000	20.4%	0.88
Chaparral	127	9.5%	1,830,000	10.3%	0.92
Pinyon-Juniper	86	6.5%	1,080,000	6.1%	1.07
Hardwoods	100	7.5%	950,000	5.3%	1.41
Ponderosa Pine	103	7.7%	1,030,000	5.8%	1.33
Mixed Conifer	135	10.1%	1,860,000	10.5%	0.97
White Fir	236	17.7%	2,660,000	15.0%	1.18
Red Fir	59	4.4%	830,000	4.7%	0.95
Subalpine Conifer	60	4.5%	1,160,000	6.5%	0.69
Eastside Pine	114	8.6%	1,310,000	7.3%	1.17
Ownership Class					
FS non-wilderness	675	50.7%	8,670,000	48.8%	1.04
Wilderness	110	8.3%	1,730,000	9.8%	0.85
Privately Owned	409	30.7%	5,410,000	30.4%	1.01
Other Public Lands	138	10.4%	1,960,000	11.0%	0.94
Total	1,330		17,800,000		

The cumulative frequency distribution for current conditions displays a wide range of available habitat utility values among the 578 taxa, from essentially zero to over 13 million units (Figure 4.2.1a). What is not clear from the frequency curve is how the species should be divided among the aforementioned classes. The frequency curve is remarkable in its smoothness: there are no abrupt changes in slope that might suggest natural breakpoints. Statistical analysis reveals that each species consistently has approximately 1 percent more available habitat than the species next in rank below it. Therefore, any rule for dividing species among these four classes is necessarily arbitrary and likely to create misclassifications. For convenience and simplicity, taxa are grouped as follows: less than 1 million habitat units are identified as specialists or occasionals (277 taxa), taxa with 1 million to 6 million units as selectives (230 taxa), and those having over 6 million units as generalists (71 taxa). The frequency curve illustrates, however, that terms such as specialist, occasional, selective, and generalist are all relative in that they simply denote relative position along a continuum of associations.

Figure 4.2.1a. Cumulative frequency distribution for current estimates of habitat utility available within the planning area for 578 taxa including mammals, birds, amphibians, and reptiles.



II. Environmental Consequences

Our ability to quantitatively project changes in habitat is limited primarily to the major forest types on national forest lands. Many of the terrestrial species found within the planning area do not rely on these habitats to a significant degree. In order to make meaningful comparisons among alternatives, the list of considered taxa was reduced using three criteria. First, aquatic and riparian dependent bird species (e.g., ducks, geese, herons, gulls, etc.) were omitted. Second, taxa that were redundant with respect to the modeled areas were omitted. This group included bird species that had identical summer and winter habitat values on the national forests; when this occurred, the winter form was dropped. Finally, species to be included must have at least 1,000 habitat units within the national forests, at least 10 percent of which must occur in the forest vegetation types. As a result of this screening, 377 taxa representing 315 species were used in the comparative analysis (see Appendix 4.2A).

Examining the response of 377 taxa to 10 alternatives on 11 national forests in 10 vegetation types over 15 decades can be a numerically overwhelming task. In order to meaningfully summarize this information, a multivariate clustering technique was used to generate a set of indices. Taxa were grouped together (clustered) based on their similarity in response across the alternatives using a technique based on principal components analysis with oblique factor rotation (Proc Varclus, SAS Institute Inc. 1989). This procedure results in each taxa being assigned to a single cluster. An aggregate score for the cluster is created as a weighted average of the individual taxa scores. These weights, called scoring coefficients, are estimated such that the overall cluster scores account for the

maximum amount of variance possible for the number of clusters chosen. Eight clusters were created. These eight clusters explain 85 percent of the overall variation in the individual responses. The minimum proportion explained by a single cluster was 72 percent, that is, at least 72 percent of the variation in the taxa within a cluster was explained by the respective cluster score.

Summary statistics calculated for each cluster reveal some of the important differences among clusters, and conversely, some of the similarities among species (Table 4.2.1b). Plotting the relative cumulative frequency curves for each cluster allows a different perspective on differences among clusters (Figure 4.2.1b). A principal difference between clusters is in how the cluster scores are weighted among forest types. Table 4.2.1c shows the cluster scores for current conditions, summarized by major forest type. Considered along with cluster membership (Appendix 4.2.1A), this information collectively suggests the following characterizations.

Cluster 1 includes the largest number of species and taxa, most of which have a high degree of association with forested habitats and national forests. On average, the national forests contribute more than 60 percent of the total habitat in the planning area, 74 percent of which comes from the forested types. Cluster 1 includes more bird species than would be expected based on a proportional assignment, although all taxonomic groups are represented. Nearly half of the bird species in the cluster are represented by both summer and winter taxa. While a wide range of habitat values are indicated, most of the taxa with low habitat sums on the FS forested areas generally have relatively abundant habitat elsewhere. The current condition scores for the cluster suggest that these taxa are more closely associated with the lower and mid-elevation zones on both the east and west sides of the Sierra Nevada.

Cluster 2 includes a disproportionately large number of reptiles. Most of the species in this cluster have no or very low associations with forested areas on the national forests, with the exception of the pinyon-juniper environments. Most taxa within the cluster are associated with dryer shrublands and chaparral. There is a very high correlation among members of this cluster, where the average R-squared value is over 98 percent.

Cluster 3 is almost exclusively birds that utilize little of the forested environments within the national forests. Many of them appear to be lower-elevation species that prefer open environments. The cluster score is weighted heavily towards montane hardwoods and pinyon-juniper forest types.

Cluster 4 includes a mix of mammals, birds, and reptiles, but no amphibians. The taxa in this cluster have low to intermediate amounts of habitat in the forested areas. While on average the national forest contribution to total habitat is slightly more than 50 percent, the proportion of that contribution which is made up of forest vegetation types ranges from 11 to 96 percent (mean = 42 percent). Eastside Pine and pinyon-juniper are disproportionately weighted in the cluster score, suggesting that many of these species are found in the eastern and northern portions of the planning area.

Cluster 5 has the second largest number of taxa among the clusters, with representative taxa from all four major taxonomic groups. Sixty percent of the amphibian species are in this group. The cluster scores suggest that these are predominately westside species that tend towards the mid-elevation forests of ponderosa pine, mixed conifer, and white fir. The intermediate (third highest) average habitat values suggest that many species in this group would be categorized as habitat selectives in the aforementioned scheme.

Cluster 6 is composed of mostly birds and mammals, with nearly one third of the mammals in this cluster. These taxa are strongly associated with forest environments, many are wide-ranging habitat generalists that span all vegetation types, and the cluster as a whole seems to utilize the higher elevation environments more so than the other, more inclusive clusters (e.g., 1 and 5).

Cluster 7 is a small group of species with limited distributions that tend towards higher elevations exclusively in distribution and habitat preferences.

Cluster 8 is a small group of 16 species spread among all four taxonomic groups that are more closely associated with the lower elevation montane hardwoods and ponderosa pine forests. On average for these taxa, less than half of the suitable habitat mapped across the planning area is found on the national forests, and less than half of that is found in the major forest types.

Cluster scores were generated for all combinations of alternatives, national forests, major forest type, and future decade. These information allows a broad spectrum of comparisons to be made. Not surprisingly, time trends in cluster scores, and by inference potential group responses, differed between forest types, national forests, and alternatives. We focus here on some of the major differences that were observed between alternatives, summed over all national forests, and on differences between forest type within a single alternative.

When comparing alternatives, it is useful to look at the cluster scores individually in order to see how habitat for different groups of taxa might change. One can also look at how the sum of the cluster scores varies among major forest types (Table 4.2.1d) as an indication of what kind of vegetation changes might be affecting the trends in individual cluster scores. When cluster scores are given equal weight and summed, it is important to recognize that this process amounts to a weighted summing of individual taxa, wherein taxa that are in clusters with many members are weighted less than taxa in clusters with few members. This is because the individual scoring coefficients are proportional to $1/m$, where m is the number of taxa in each cluster.

Two clusters, Clusters 2 and 7, show no apparent differences among most alternatives, reflecting the high degree of similarity among alternatives in the treatment of the pinyon-juniper and higher-elevation forests. The exception to this pattern is for Alternatives 4 and 7, which show lower scores through time for Cluster 2 than the other alternatives. Cluster 2 exhibits a sharp decline in first two decades, followed by a long period of gradually increasing or steady scores. Cluster 7 scores steadily increase throughout the planning horizon.

The remaining clusters, Clusters 1, 3, 4, 5, 6, and 8, show similar trends among all alternatives, but there is separation between the alternatives (Figures 4.2.1c-4.2.1h). Clusters 1, 5, and 6 suggests a pattern of either modest declines of increases in the first three to five decades, followed by steadily increasing scores thereafter. The near-term separation between alternatives seems to favor alternatives with higher levels of active treatments (alternatives 1 and 4), but this advantage is lost after four to five decades to Alternative 8 Modified, and lost in the long term to alternatives 3 and 6. Cluster 8 demonstrates a pattern similar to Clusters 1, 5, and 6, but with more confusion among the alternatives. Alternative 2 and the min-level alternative separate fairly quickly as two alternatives that quickly produce lower scores than the tangle of other alternatives. Cluster 3 demonstrates an abrupt drop in scores for the first two decades in all alternatives, followed a period of increasing trends that tend to peak in decades nine to thirteen. Cluster 4 exhibits the most dramatic increases of all the clusters, increasing rapidly in the first six to nine decades under all alternatives.

The composite scores for each forest type under Alternative 8 Modified help to explain some of the patterns observed in the cluster scores. The patterns for Clusters 2 and 7 are mirrored in the composite scores for pinyon-juniper, and for lodgepole pine and subalpine conifer, respectively (Table 4.2.1d). The large increase in the composite score for lodgepole pine between decades 13 and 14 is likely an artifact of a modeling error and should be discounted. The initial drop in Cluster 1 closely tracks changes in white fir and eastside pine. As habitat values increase later in the white fir and in mixed conifer types through time, the overall cluster score increases. The trend in Cluster 3 is heavily influenced by the initial drop in pinyon juniper, even though the montane hardwood and ponderosa pine values are steadily increasing through this same period. Trends in Cluster 4 are dominated by changes in lodgepole pine. Cluster 5 responds principally to changes in white fir and mixed conifer. Ponderosa pine is an important component of Cluster 5, but the trend there is essentially flat. Cluster 6 is also heavily influenced by white fir, but mixed conifer, red fir, lodgepole pine, and eastside pine are important components. Cluster 8 is essentially tracking changes in montane hardwoods and mixed conifer, with some influence of pinyon-juniper. Again, ponderosa pine is important but shows no real trend over time.

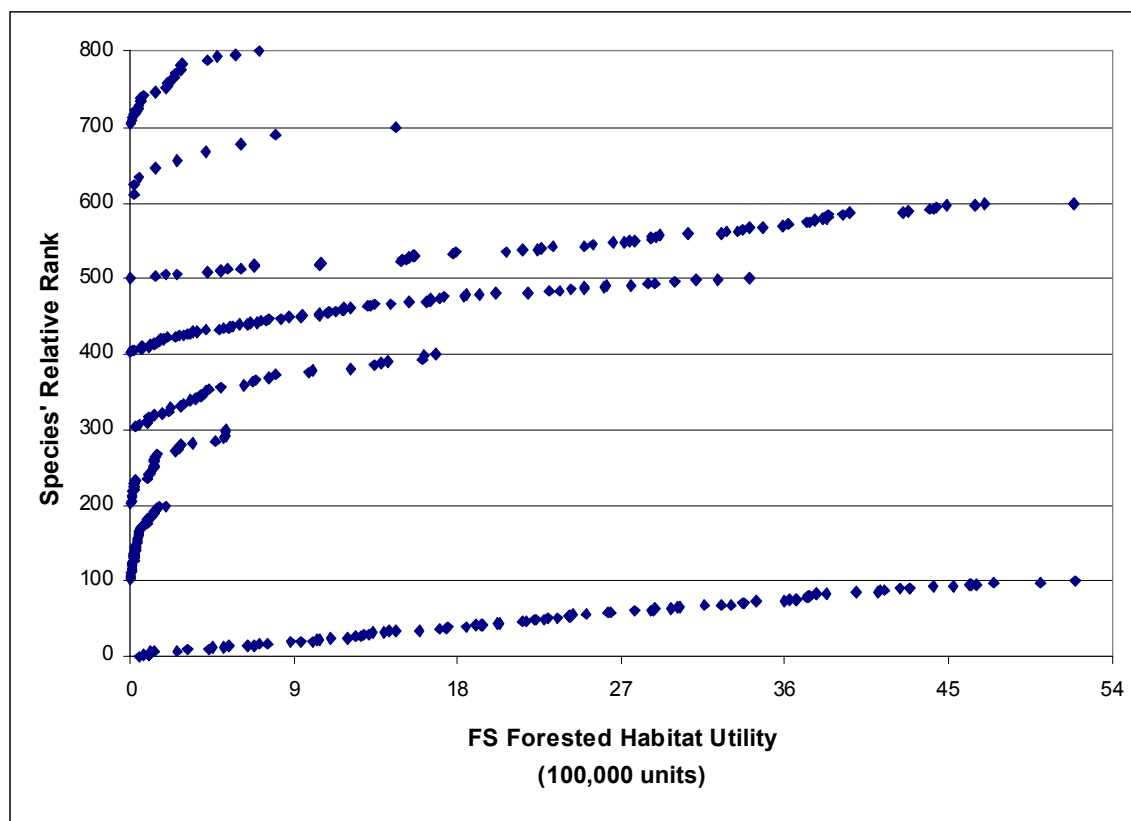
Table 4.2.1b. Summary statistics calculated for the taxa assigned to eight clusters through a nonhierarchical multivariate clustering technique based on their changes in habitat utilities across alternatives. The first five rows in the body of the table are counts; the remaining rows are averages. Cluster Rsqr is a measure of the degree of correlation between an individual taxon's score and the cluster score.

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	Cluster 7	Cluster 8
Amphibians	2	1	1	0	13	2	1	2
Birds	48	6	16	14	30	24	3	6
Mammals	18	12	1	10	17	32	5	5
Reptiles	6	21	0	4	11	1	0	3
Species	74	40	18	28	71	59	9	16
Taxa	96	42	28	32	81	65	9	24
Cluster Rsqr	0.881	0.982	0.792	0.780	0.868	0.847	0.717	0.726
FS Contribution	61.2%	51.7%	46.2%	53.9%	58.0%	67.9%	85.8%	46.5%
% Forested of FS habitat	73.6%	27.3%	35.7%	41.7%	73.2%	79.5%	68.9%	45.4%
% FS Forest of Total	46.0%	15.5%	17.3%	23.5%	44.2%	55.2%	58.9%	21.4%
Sum of FS forested habitat	2,342,462	51,903	179,161	631,710	1,156,874	2,592,845	416,709	200,486

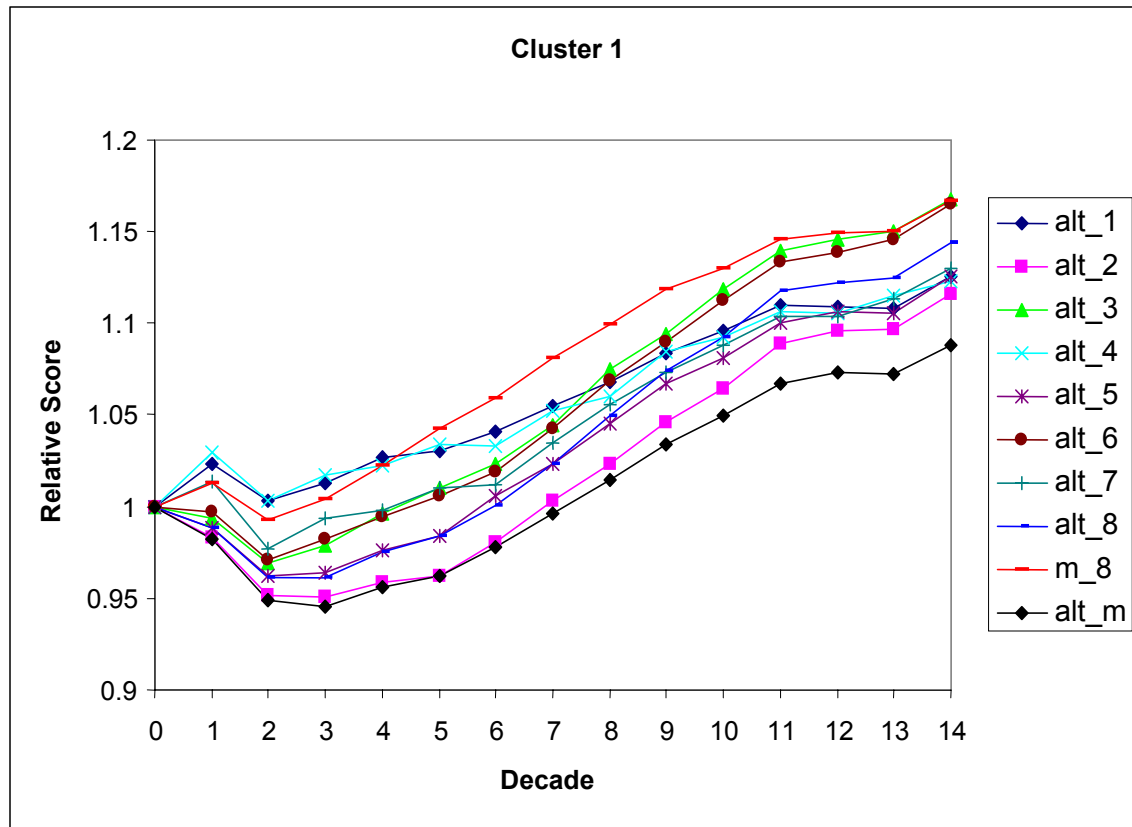
Table 4.2.1c. Cluster scores for the current condition, summarized by major forest types.

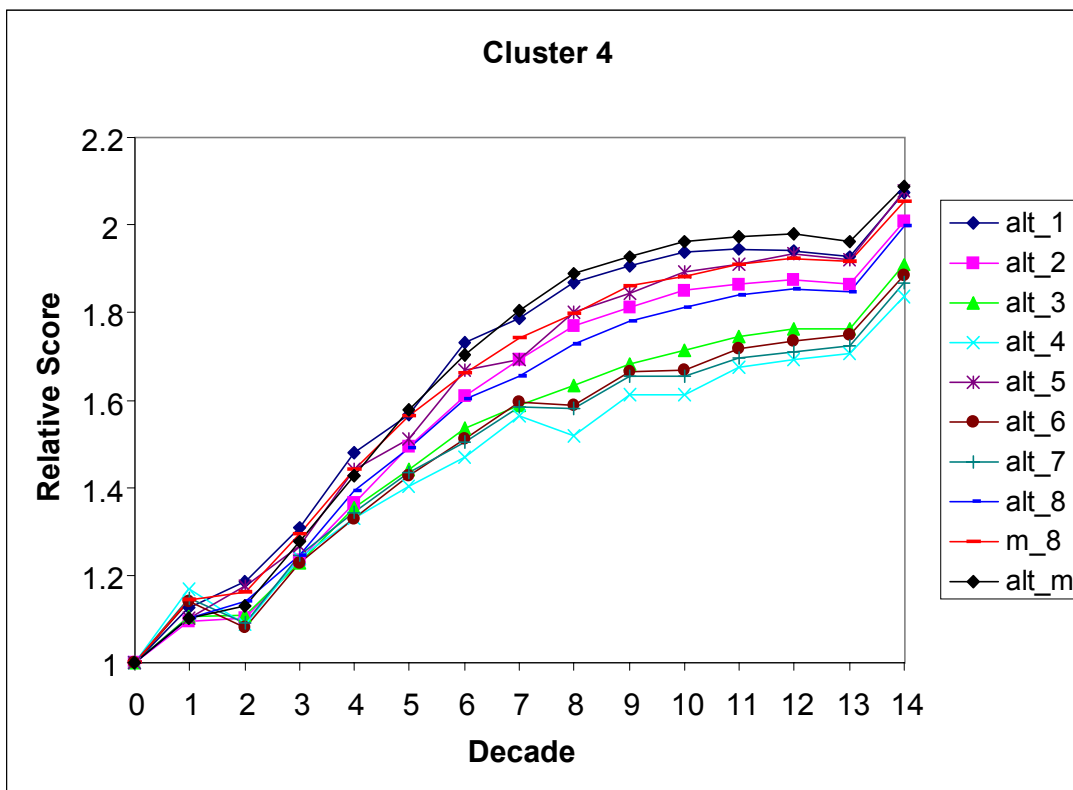
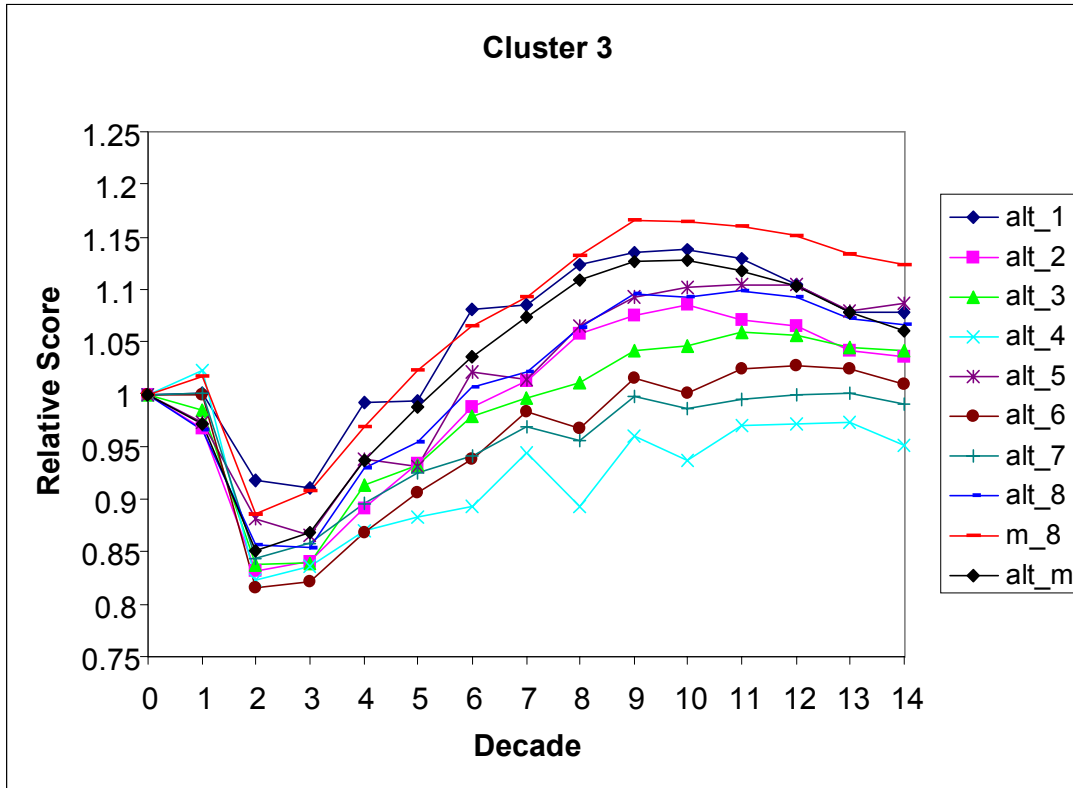
Forest Type	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6	Cluster 7	Cluster 8	Sum
Montane Hardwood	132	0	69	54	73	74	1	77	481
Ponderosa Pine	209	0	14	63	129	171	2	82	670
Mixed Conifer	329	0	6	18	243	339	31	40	1,006
White Fir	785	-	10	54	501	845	61	-	2,256
Red Fir	171	-	2	17	86	378	151	-	806
Lodgepole Pine	108	-	-	34	40	248	127	-	558
Subalpine Conifer	17	-	-	6	7	120	74	-	224
Eastside Pine	453	0	14	235	63	429	-	-	1,194
Pinyon-Juniper	130	51	62	149	28	83	-	14	516
Total	2,334	52	177	630	1,170	2,687	448	212	7,710

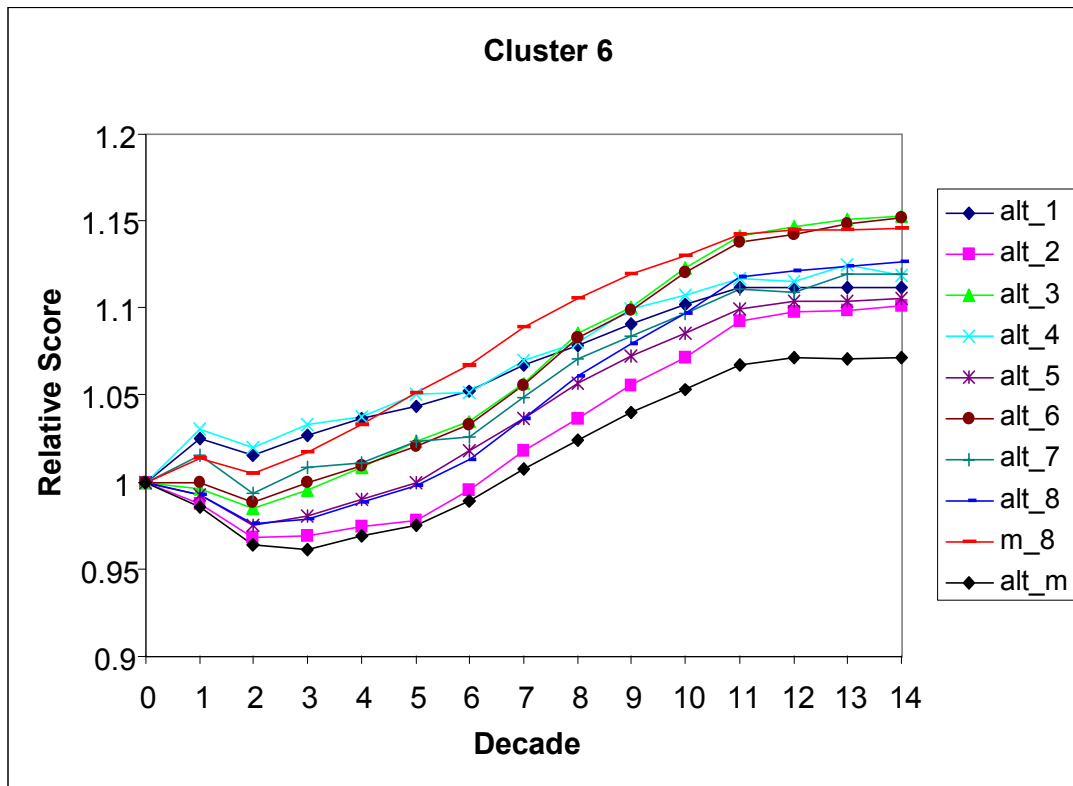
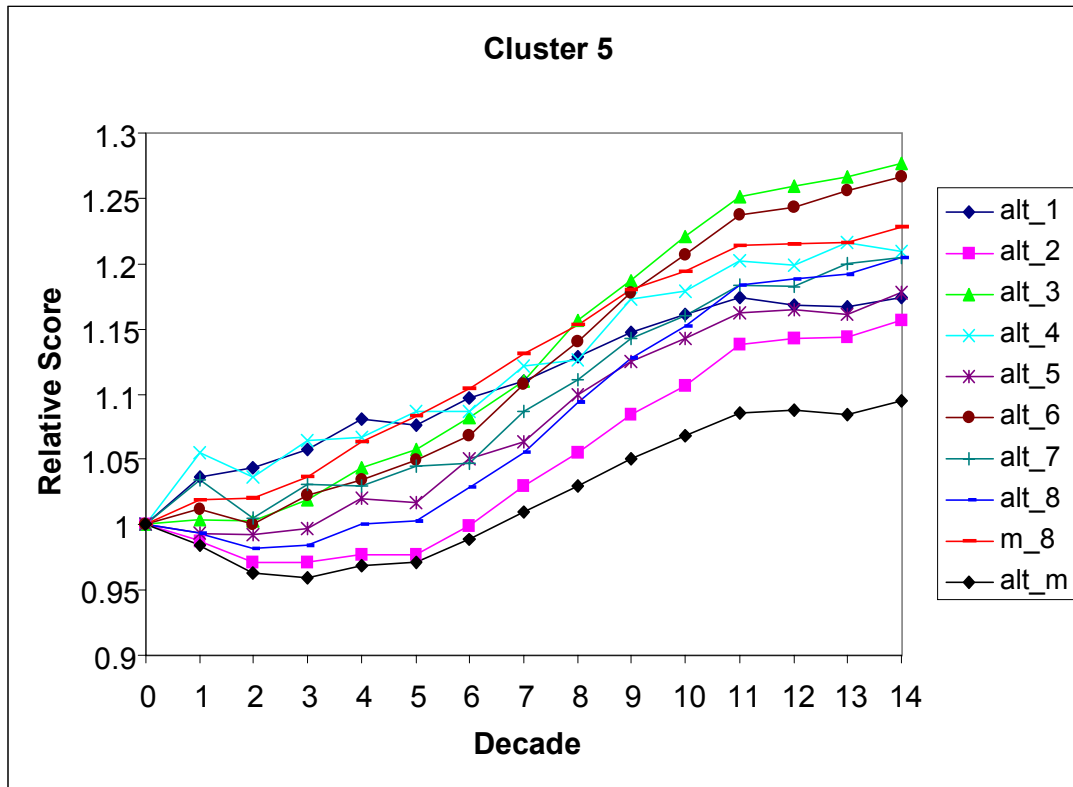
Figure 4.2.1b. Relative cumulative frequency distributions for taxa grouped into eight clusters. The horizontal axis refer to the current total habitat utility, summed across forest vegetation types on the national forests. The vertical axis is scaled such that cluster are successively stacked. Cluster 1 is on the bottom and ranges from 0 to 100; Cluster 2 ranges from 100 to 200, and so forth.



Figures 4.2.1c-h. Relative cluster scores through time for each alternative, summarized over all forest types. Cluster scores are weighted averages of the individual taxa habitat utility values, where each taxon belongs to a single cluster. Absolute values for cluster scores were divided by the current condition estimate to generate relative scores depicted below.







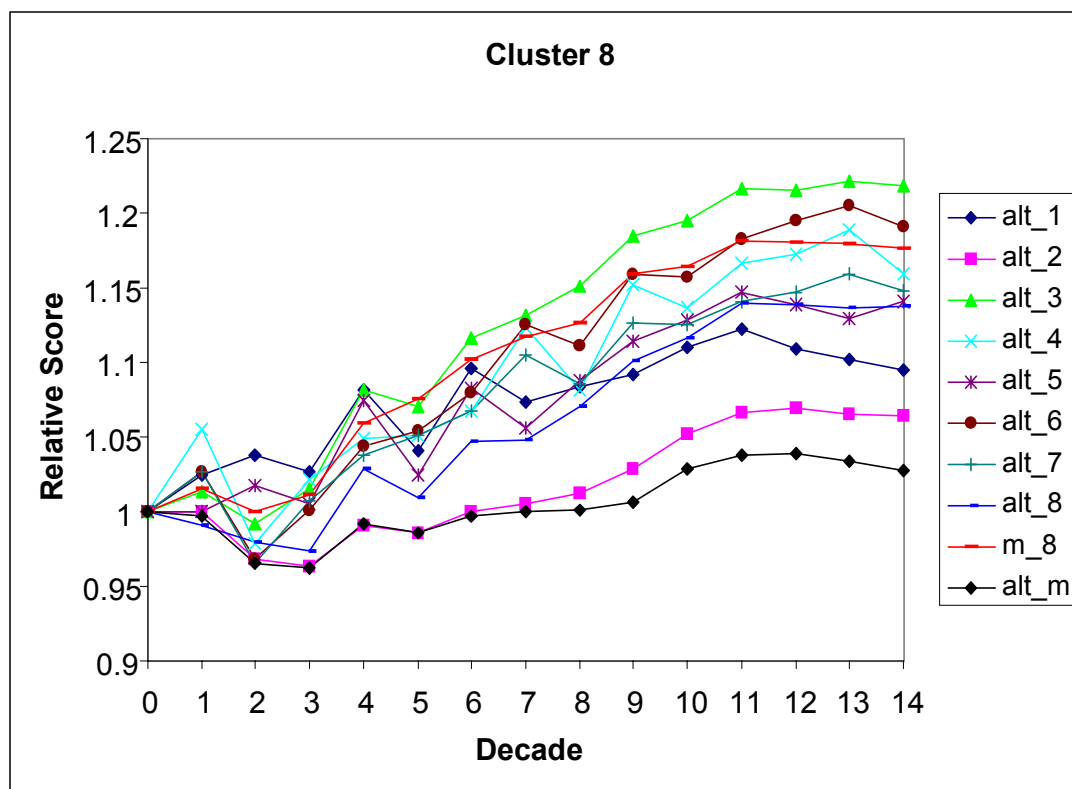
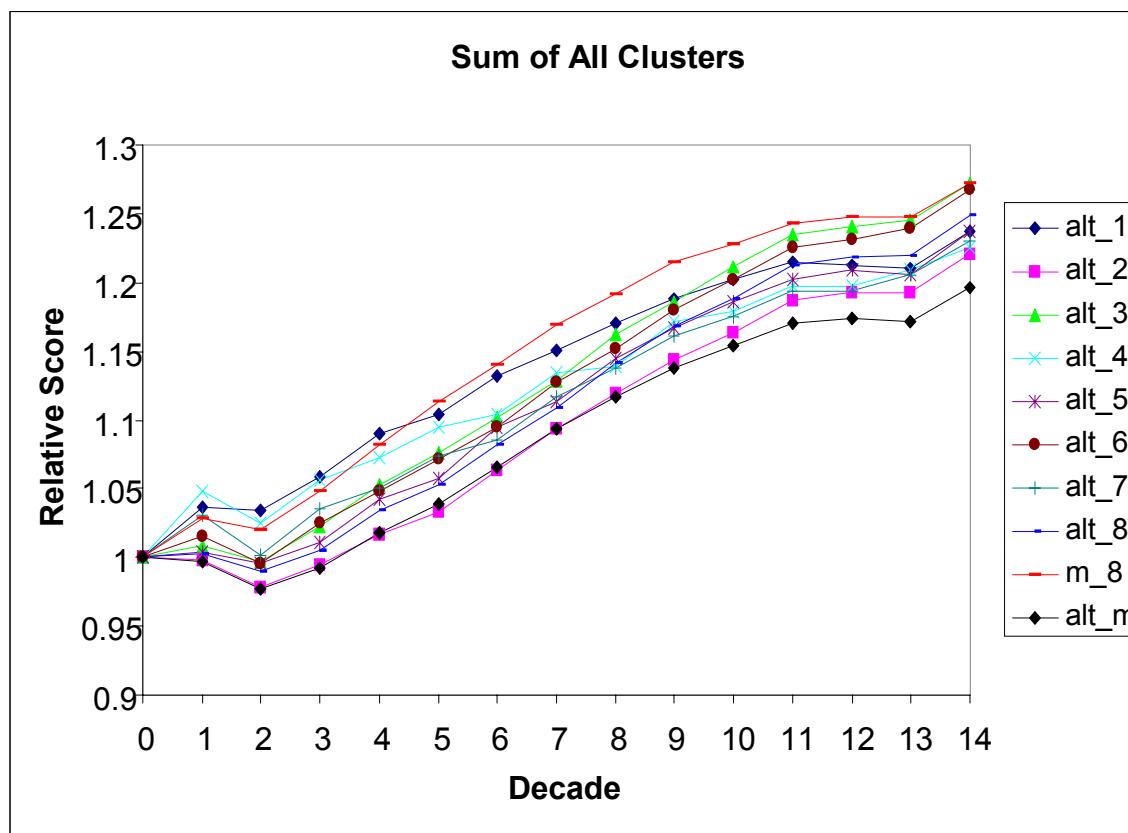


Table 4.2.1d. Percentage changes from current conditions in composite cluster scores (the sum of clusters 1 through 8) for each forest type projected through time for Alternative 8 Modified.

Forest Type	Decade													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Montane Hardwood	5	9	9	20	23	26	28	28	38	37	43	44	45	46
Ponderosa Pine	2	-1	0	-2	0	1	1	3	2	3	2	2	1	1
Mixed Conifer	9	10	15	23	29	35	41	47	52	55	57	59	59	57
White Fir	-1	-2	-1	-1	1	2	4	6	9	10	12	12	12	13
Red Fir	0	0	0	0	-1	-2	-2	-2	-3	-3	-3	-3	-4	-4
Lodgepole Pine	25	46	74	96	115	132	144	151	156	161	165	169	170	211
Subalpine Conifer	4	9	11	9	9	8	9	8	8	8	8	9	9	9
Eastside Pine	0	-1	-2	-3	-2	-2	-1	-1	-1	-1	-1	0	0	-1
Pinyon-Juniper	-8	-42	-40	-35	-29	-26	-23	-19	-17	-16	-17	-18	-21	-22

Figure 4.2.1i. The composite cluster score through time for Alternative 8 Modified, summarized over all forest types and taxa.



Summary of Effects of the Alternatives on Terrestrial Vertebrate Species

Projected changes in broad-scale forest structure imply concurrent changes in the relative quality of available habitat for a wide range of species. Assuming that the CWHR relations of these species provide useful indicators of change, the results of this aggregate analysis have several important implications.

First, vegetation changes and subsequent changes in habitat utility are similar across all alternatives. Future habitat projections tend to be more similar among alternatives than between future and current projections within an alternative. The anticipated effects on habitat for many terrestrial vertebrates generally move in a consistent direction but vary in magnitude between alternatives. Groups of species that gain habitat in one alternative tend to gain in all alternatives, while those that lose in one alternative lose in others as well. As described in earlier chapters, much of the forested area is expected to grow larger trees and increase in overstory under all alternatives. As a result, species preferring these conditions will find habitat quality generally increasing on a regional basis.

The cluster analysis and generation of cluster scores suggest that overall improvements in habitat conditions from the perspective of forest-dependent vertebrate species are possible. Figure 4.2.1i depicts the change in the composite cluster score, summed over all clusters and forest types. This figure shows an overall net increase in habitat utility through time. This figure is somewhat surprising given earlier analyses for the DEIS that suggested that net gains in habitat for some species

were essentially offset by losses for other species. That result may be explained in part by the 50 year time horizon used in the DEIS, which may have been too short for long-term gains or losses to be fully revealed. A second difference between the current analysis and that completed for the DEIS is the higher wildland fire rates used for the FEIS. These higher rates of disturbance can have a positive effect of species that prefer early seral or more open environments. These are the same species that demonstrated expected losses in the DEIS analysis.

Undoubtedly there will be species that gain and lose habitat under any alternative and we can anticipate where some of these changes might occur. It is interesting to note that net habitat values in the red fir, ponderosa pine, and eastside pine forest are expected to remain flat or decline slightly, while the white fir forests will not see measurable increases for 50 years or more. In contrast, the montane hardwood, mixed conifer, and lodgepole pine forests are projected for large and rapid increases in net habitat value. Additional analysis coupled with monitoring and adaptive management will undoubtedly lead to greater insight into whether our projections are accurate and to what extent management actions might exert a positive influence.

Table 4.2.1e. Listing of taxa included in the cluster analysis described in Section 4.2.1.

Species Name	Season	Cluster	Cluster R-squared	FS contribution	Forested % of FS Lands	FS Forest % of Total	Total Habitat
Western Toad	Y	1	0.94	54%	62%	34%	6,039,235
Spotted Frog	Y	1	0.73	56%	88%	50%	89,300
Turkey Vulture	S	1	0.92	55%	64%	35%	7,078,485
Osprey	S	1	0.91	67%	91%	61%	6,208,277
Bald Eagle	S	1	0.91	60%	90%	54%	3,148,831
Bald Eagle	W	1	0.91	64%	85%	54%	4,476,185
Sharp-Shinned Hawk	S	1	0.98	64%	86%	55%	6,645,031
Sharp-Shinned Hawk	W	1	0.94	61%	76%	47%	7,788,194
Cooper's Hawk	S	1	0.93	65%	80%	52%	5,535,993
Northern Goshawk	W	1	0.87	66%	86%	57%	5,755,950
Red-Tailed Hawk	S	1	0.92	62%	78%	48%	9,406,152
Red-Tailed Hawk	W	1	0.96	59%	75%	44%	8,289,783
Golden Eagle	S	1	0.98	63%	70%	44%	10,598,640
Golden Eagle	W	1	0.95	57%	65%	37%	8,131,182
Merlin	W	1	0.89	56%	63%	35%	2,908,350
Peregrine Falcon	S	1	0.93	61%	71%	43%	8,576,324
Peregrine Falcon	W	1	0.93	60%	63%	38%	13,299,973
Prairie Falcon	S	1	0.93	57%	64%	37%	6,543,111
Prairie Falcon	W	1	0.93	56%	61%	34%	6,876,707
Mountain Quail	W	1	0.96	60%	65%	39%	7,334,964
Flammulated Owl	S	1	0.92	70%	96%	67%	6,192,931
Western Screech-Owl	Y	1	0.78	55%	75%	41%	4,192,812
Great Horned Owl	S	1	0.97	63%	82%	51%	8,341,453
Great Horned Owl	W	1	0.97	63%	83%	52%	8,201,434
Northern Pygmy-Owl	Y	1	0.96	64%	87%	55%	6,135,357
Long-Eared Owl	S	1	0.95	51%	50%	25%	3,928,482
Long-Eared Owl	W	1	0.95	53%	42%	23%	2,856,604
Short-Eared Owl	W	1	0.76	35%	16%	6%	1,947,985
Northern Saw-Whet Owl	Y	1	0.96	68%	90%	61%	6,779,277
Common Nighthawk	S	1	0.91	59%	62%	37%	6,573,477
White-Throated Swift	S	1	0.98	64%	76%	48%	6,513,532
Lewis's Woodpecker	S	1	0.95	59%	78%	46%	3,007,902
Lewis's Woodpecker	W	1	0.95	52%	75%	39%	3,237,386
Acorn Woodpecker	Y	1	0.72	52%	90%	47%	1,514,413
Red-Naped Sapsucker	W	1	0.78	91%	90%	82%	132,339
Red-Breasted Sapsucker	S	1	0.92	68%	94%	64%	5,825,233
Downy Woodpecker	Y	1	0.93	56%	81%	45%	2,838,597
White-Headed Woodpecker	Y	1	0.93	69%	98%	68%	5,566,904
Northern Flicker	S	1	0.94	63%	77%	48%	7,708,874
Northern Flicker	W	1	0.94	58%	68%	39%	5,528,071
Western Wood-Pewee	S	1	0.91	67%	93%	62%	8,327,147
Steller's Jay	S	1	0.92	68%	97%	66%	6,717,830
Steller's Jay	W	1	0.95	64%	96%	61%	5,607,863
Mountain Chickadee	W	1	0.88	69%	92%	64%	7,252,775
White-Breasted Nuthatch	S	1	0.90	70%	93%	65%	6,113,711
White-Breasted Nuthatch	W	1	0.95	70%	93%	65%	5,912,854
Pygmy Nuthatch	Y	1	0.90	71%	98%	69%	4,365,030
Brown Creeper	S	1	0.82	68%	98%	67%	5,065,390
Brown Creeper	W	1	0.85	68%	98%	66%	5,432,570
Ruby-Crowned Kinglet	W	1	0.91	57%	73%	42%	5,352,275
Western Bluebird	S	1	0.82	61%	80%	48%	3,284,380
Mountain Bluebird	S	1	0.67	64%	72%	46%	2,698,925
Swainson's Thrush	S	1	0.92	64%	86%	55%	2,393,024
American Robin	W	1	0.92	58%	78%	45%	4,091,330
Cedar Waxwing	W	1	0.95	54%	71%	38%	1,433,716
Plumbeous Vireo	S	1	0.95	91%	89%	81%	122,717
Warbling Vireo	S	1	0.84	65%	95%	62%	4,275,158
Orange-Crowned Warbler	S	1	0.91	47%	51%	24%	2,192,403
Virginia's Warbler	S	1	0.72	96%	62%	59%	124,438
Western Tanager	S	1	0.87	68%	98%	66%	6,376,092
Black-Headed Grosbeak	S	1	0.92	61%	89%	55%	4,201,811
Spotted Towhee	S	1	0.86	61%	61%	37%	3,847,469
Spotted Towhee	W	1	0.86	55%	50%	27%	3,781,663
Chipping Sparrow	S	1	0.75	66%	85%	56%	5,154,310

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Species Name	Season	Cluster	Cluster R-squared	FS contribution	Forested % of FS Lands	FS Forest % of Total	Total Habitat
Fox Sparrow	S	1	0.85	68%	66%	45%	5,872,323
Song Sparrow	S	1	0.70	55%	79%	44%	1,561,640
Song Sparrow	W	1	0.70	48%	72%	35%	889,572
Cassin's Finch	W	1	0.80	68%	99%	67%	1,396,793
House Finch	S	1	0.64	51%	47%	24%	1,907,447
House Finch	W	1	0.64	46%	41%	19%	1,373,455
Lesser Goldfinch	S	1	0.47	55%	56%	31%	2,867,870
Cordilleran Flycatcher	S	1	0.74	90%	95%	85%	153,860
Broad-Footed Mole	Y	1	0.69	55%	76%	42%	1,802,887
Long-Eared Myotis	Y	1	0.93	65%	85%	55%	7,515,469
Long-Legged Myotis	Y	1	0.95	65%	83%	54%	8,651,051
California Myotis	Y	1	0.89	58%	55%	32%	8,687,026
Small-Footed Myotis	Y	1	0.95	51%	71%	36%	3,022,145
Big Brown Bat	Y	1	0.92	61%	65%	40%	11,943,261
Western Red Bat	Y	1	0.96	33%	61%	20%	566,070
Hoary Bat	Y	1	0.93	65%	86%	56%	6,646,697
Mountain Beaver	Y	1	0.76	73%	97%	71%	2,473,654
Merriam's Chipmunk	Y	1	0.93	78%	55%	43%	1,006,507
California Ground Squirrel	Y	1	0.90	59%	60%	35%	6,918,543
Western Gray Squirrel	Y	1	0.89	61%	91%	55%	3,479,882
Pinyon Mouse	Y	1	0.89	57%	50%	29%	6,633,997
House Mouse	Y	1	0.86	54%	49%	26%	4,508,905
Gray Fox	Y	1	0.88	62%	49%	30%	6,368,812
Ringtail	Y	1	0.86	61%	46%	28%	4,725,644
Western Spotted Skunk	Y	1	0.94	58%	50%	29%	6,969,231
Striped Skunk	Y	1	0.96	55%	52%	29%	7,827,635
Western Fence Lizard	Y	1	0.94	59%	57%	33%	8,902,238
Racer	Y	1	0.88	49%	50%	25%	5,835,783
Western Gopher Snake	Y	1	0.92	52%	49%	25%	8,481,834
Common Kingsnake	Y	1	0.82	56%	53%	30%	4,163,325
Common Garter Snake	Y	1	0.95	52%	69%	36%	6,227,330
Western Rattlesnake	Y	1	0.89	55%	61%	33%	9,833,014
Red-Spotted Toad	Y	2	1.00	38%	54%	21%	26,762
Burrowing Owl	S	2	1.00	43%	11%	5%	3,836,313
Burrowing Owl	W	2	1.00	57%	18%	10%	1,440,111
Lesser Nighthawk	S	2	1.00	59%	28%	16%	443,291
Northern Mockingbird	S	2	1.00	45%	21%	9%	381,997
Black-Chinned Sparrow	S	2	0.87	76%	26%	20%	768,382
Scott's Oriole	S	2	1.00	62%	53%	33%	340,237
Lesser Goldfinch	W	2	1.00	38%	27%	10%	636,292
American Goldfinch	W	2	1.00	32%	14%	5%	647,472
Merriam's Shrew	Y	2	1.00	39%	14%	6%	1,665,930
White-Tailed Antelope Squirrel	Y	2	1.00	45%	21%	10%	1,380,515
Chisel-Toothed Kangaroo Rat	Y	2	1.00	39%	12%	5%	858,100
Pacific Kangaroo Rat	Y	2	0.84	96%	16%	15%	146,821
Panamint Kangaroo Rat	Y	2	1.00	54%	24%	13%	994,549
Merriam's Kangaroo Rat	Y	2	1.00	65%	22%	14%	620,351
Southern Grasshopper Mouse	Y	2	1.00	67%	13%	9%	636,253
Desert Woodrat	Y	2	0.82	28%	19%	5%	917,670
Sagebrush Vole	Y	2	1.00	41%	16%	7%	1,369,873
Kit Fox	Y	2	1.00	38%	10%	4%	425,362
Wild Horse	Y	2	0.74	49%	19%	9%	1,351,625
Feral Burro	Y	2	1.00	39%	26%	10%	250,858
Desert Tortoise	Y	2	1.00	98%	53%	53%	2,724
Banded Gecko	Y	2	1.00	55%	12%	7%	352,665
Desert Iguana	Y	2	1.00	37%	32%	12%	82,093
Chuckwalla	Y	2	1.00	44%	16%	7%	124,053
Zebra-Tailed Lizard	Y	2	1.00	57%	15%	8%	255,175
Desert Collared Lizard	Y	2	1.00	38%	18%	7%	1,733,152
Desert Spiny Lizard	Y	2	1.00	69%	23%	15%	287,923
Desert Horned Lizard	Y	2	1.00	42%	11%	5%	904,459
Panamint Alligator Lizard	Y	2	1.00	69%	25%	17%	232,091
Western Blind Snake	Y	2	1.00	46%	25%	12%	212,323
Rosy Boa	Y	2	1.00	100%	74%	74%	1,891

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Species Name	Season	Cluster	Cluster R-squared	FS contribution	Forested % of FS Lands	FS Forest % of Total	Total Habitat
Spotted Leaf-Nosed Snake	Y	2	1.00	9%	30%	3%	29,300
Coachwhip	Y	2	1.00	65%	13%	9%	539,093
Western Patch-Nosed Snake	Y	2	1.00	43%	15%	7%	608,006
Glossy Snake	Y	2	1.00	36%	12%	4%	224,935
Ground Snake	Y	2	1.00	54%	28%	15%	110,904
Western Shovel-Nosed Snake	Y	2	1.00	41%	41%	17%	52,674
Southwestern Black-Headed Snake	Y	2	1.00	36%	58%	21%	47,715
Lyre Snake	Y	2	1.00	27%	65%	17%	36,385
Sidewinder	Y	2	1.00	55%	13%	7%	273,306
Mojave Rattlesnake	Y	2	1.00	100%	100%	100%	1,335
Kern Canyon Slender Salamander	Y	3	0.93	96%	32%	30%	30,298
Red-Shouldered Hawk	S	3	0.90	25%	34%	9%	223,326
Red-Shouldered Hawk	W	3	0.90	25%	34%	9%	223,315
Ash-Throated Flycatcher	S	3	0.83	53%	49%	26%	2,017,743
Western Kingbird	S	3	0.97	41%	14%	6%	2,009,150
Western Scrub Jay	Y	3	0.93	49%	39%	19%	1,431,931
American Crow	S	3	0.94	23%	20%	5%	260,143
American Crow	W	3	0.94	22%	19%	4%	230,145
Oak Titmouse	S	3	0.94	35%	43%	15%	675,201
Bushtit	W	3	0.47	46%	35%	16%	2,887,423
Bewick's Wren	S	3	0.66	55%	33%	18%	2,846,198
Bewick's Wren	W	3	0.66	58%	40%	23%	2,263,994
House Wren	S	3	0.82	48%	32%	15%	1,633,696
House Wren	W	3	0.85	71%	100%	71%	13,852
Blue-Gray Gnatcatcher	S	3	0.94	50%	26%	13%	2,166,484
Blue-Gray Gnatcatcher	W	3	0.95	79%	12%	9%	46,816
Wrentit	S	3	0.44	44%	28%	12%	1,069,937
Wrentit	W	3	0.66	42%	21%	9%	987,530
Phainopepla	S	3	0.82	27%	34%	9%	281,515
Phainopepla	W	3	0.82	25%	27%	7%	273,853
Yellow-Rumped Warbler	W	3	0.89	37%	62%	23%	564,767
Lazuli Bunting	S	3	0.60	51%	42%	21%	2,381,354
California Towhee	Y	3	0.92	45%	38%	17%	758,187
Lark Sparrow	S	3	0.61	36%	12%	4%	2,637,605
White-Crowned Sparrow	W	3	0.66	42%	15%	6%	2,348,998
Bullock's Oriole	S	3	0.73	55%	84%	46%	736,016
Lawrence's Goldfinch	S	3	0.95	39%	47%	18%	759,310
California Mouse	Y	3	0.45	74%	32%	24%	543,618
Cooper's Hawk	W	4	0.73	59%	80%	47%	2,594,776
Swainson's Hawk	S	4	0.91	39%	28%	11%	907,848
Ferruginous Hawk	W	4	0.90	53%	39%	21%	1,586,458
Rough-Legged Hawk	W	4	0.90	52%	40%	21%	1,700,570
American Kestrel	W	4	0.60	50%	49%	25%	4,064,791
Common Poorwill	S	4	0.86	56%	48%	27%	5,290,641
Black-Chinned Hummingbird	S	4	0.89	39%	55%	22%	414,376
Tree Swallow	S	4	0.73	62%	88%	55%	2,439,700
Northern Rough-Winged Swallow	S	4	0.72	50%	40%	20%	6,869,271
Pinyon Jay	S	4	0.82	59%	57%	33%	2,000,082
Clark's Nutcracker	W	4	0.59	77%	96%	74%	2,286,008
Western Bluebird	W	4	0.73	50%	65%	32%	1,282,799
Northern Shrike	W	4	0.81	44%	14%	6%	1,465,212
Loggerhead Shrike	S	4	0.90	46%	30%	14%	2,811,401
Golden-Crowned Sparrow	W	4	0.71	44%	34%	15%	1,440,199
Western Meadowlark	S	4	0.64	45%	34%	15%	2,798,636
Juniper Titmouse	S	4	0.85	63%	70%	44%	661,756
Cassin's Vireo	S	4	0.74	67%	75%	50%	1,948,820
Inyo Shrew	Y	4	0.84	91%	20%	19%	157,326
Black-Tailed Hare	Y	4	0.77	49%	27%	13%	5,946,653
Belding's Ground Squirrel	Y	4	0.64	57%	28%	16%	2,438,447
Botta's Pocket Gopher	Y	4	0.80	52%	47%	25%	2,536,253
Great Basin Pocket Mouse	Y	4	0.53	45%	13%	6%	3,012,076

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Species Name	Season	Cluster	Cluster R-squared	FS contribution	Forested % of FS Lands	FS Forest % of Total	Total Habitat
Western Harvest Mouse	Y	4	0.64	53%	27%	14%	5,384,415
Canyon Mouse	Y	4	0.88	48%	17%	8%	3,334,026
Brush Mouse	Y	4	0.87	56%	51%	29%	5,584,453
California Vole	Y	4	0.75	45%	11%	5%	949,670
Badger	Y	4	0.78	52%	26%	13%	5,211,965
Sagebrush Lizard	Y	4	0.77	62%	47%	29%	5,592,373
Side-Blotched Lizard	Y	4	0.83	44%	18%	8%	2,634,245
Desert Night Lizard	Y	4	0.90	69%	33%	23%	570,422
Striped Whipsnake	Y	4	0.91	48%	26%	13%	3,925,291
Long-Toed Salamander	Y	5	0.95	58%	95%	54%	2,807,312
Pacific Giant Salamander	Y	5	0.92	37%	28%	10%	167,551
Rough-Skinned Newt	Y	5	0.96	35%	78%	27%	661,789
Sierra Newt	Y	5	0.93	43%	70%	30%	1,614,168
Ensatina	Y	5	0.94	63%	80%	50%	2,359,573
California Slender Salamander	Y	5	0.90	6%	25%	1%	215,995
Pacific Slender Salamander	Y	5	0.77	82%	62%	51%	406,668
Arboreal Salamander	Y	5	0.91	44%	77%	34%	456,164
Pacific Treefrog	Y	5	0.87	59%	68%	40%	8,008,508
Foothill Yellow-Legged Frog	Y	5	0.96	46%	77%	35%	1,153,163
Mountain Yellow-Legged Frog	Y	5	0.79	80%	95%	76%	785,464
Northern Leopard Frog	Y	5	0.93	56%	78%	44%	142,818
Bullfrog	Y	5	0.95	46%	68%	31%	3,042,971
California Condor	S	5	0.79	94%	52%	49%	321,327
American Kestrel	S	5	0.88	61%	69%	42%	8,156,905
California Quail	Y	5	0.95	50%	42%	21%	7,667,534
Band-Tailed Pigeon	S	5	0.97	64%	93%	59%	4,226,015
Mourning Dove	S	5	0.87	55%	70%	38%	4,432,425
Mourning Dove	W	5	0.89	39%	54%	21%	1,576,403
Barn Owl	Y	5	0.49	52%	22%	11%	6,271,503
Spotted Owl	S	5	0.77	67%	99%	66%	2,606,091
Spotted Owl	W	5	0.87	63%	99%	63%	2,290,680
Great Gray Owl	S	5	0.71	81%	100%	80%	200,820
Great Gray Owl	W	5	0.71	79%	100%	79%	166,858
Black Swift	S	5	0.77	68%	92%	62%	4,177,330
Vaux's Swift	S	5	0.90	63%	92%	58%	1,884,516
Anna's Hummingbird	S	5	0.88	49%	53%	26%	2,002,800
Broad-Tailed Hummingbird	S	5	0.72	94%	63%	59%	194,749
Red-Breasted Sapsucker	W	5	0.96	54%	89%	48%	1,724,433
Williamson's Sapsucker	W	5	0.86	63%	99%	62%	2,144,755
Pileated Woodpecker	Y	5	0.88	66%	98%	64%	2,984,839
Olive-Sided Flycatcher	S	5	0.86	68%	96%	65%	4,572,632
Hammond's Flycatcher	S	5	0.73	67%	98%	66%	2,772,280
Purple Martin	S	5	0.73	43%	84%	36%	678,832
Violet-Green Swallow	S	5	0.90	60%	88%	53%	5,863,361
Barn Swallow	S	5	0.95	44%	49%	21%	6,089,343
Gray Jay	S	5	0.73	91%	92%	83%	150,351
Chestnut-Backed Chickadee	Y	5	0.74	50%	82%	41%	800,696
Winter Wren	S	5	0.85	62%	97%	60%	1,808,937
Winter Wren	W	5	0.85	62%	97%	60%	2,191,409
Townsend's Solitaire	S	5	0.81	69%	99%	68%	4,404,420
Townsend's Solitaire	W	5	0.84	59%	82%	48%	3,422,407
Varied Thrush	W	5	0.90	43%	75%	33%	951,022
Nashville Warbler	S	5	0.89	68%	79%	54%	4,852,424
Yellow Warbler	S	5	0.96	62%	83%	52%	4,668,464
Black-Throated Gray Warbler	S	5	0.86	65%	83%	54%	3,712,037
Hermit Warbler	S	5	0.96	66%	98%	65%	4,371,609
Brewer's Blackbird	S	5	0.94	59%	79%	46%	4,736,791
Brewer's Blackbird	W	5	0.93	51%	75%	38%	1,691,315
Purple Finch	S	5	0.98	64%	98%	63%	2,939,226
Purple Finch	W	5	0.96	57%	90%	51%	1,839,544
Evening Grosbeak	S	5	0.86	68%	98%	66%	3,494,257

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Species Name	Season	Cluster	Cluster R-squared	FS contribution	Forested % of FS Lands	FS Forest % of Total	Total Habitat
Evening Grosbeak	W	5	0.90	64%	91%	58%	4,265,815
Trowbridge's Shrew	Y	5	0.94	65%	88%	57%	4,111,072
Shrew-Mole	Y	5	0.89	62%	99%	62%	158,696
Yuma Myotis	Y	5	0.96	55%	68%	38%	4,379,055
Fringed Myotis	Y	5	0.95	57%	65%	37%	3,261,338
Western Pipistrelle	Y	5	0.92	49%	41%	20%	1,459,536
Spotted Bat	Y	5	0.86	57%	65%	37%	1,944,966
Townsend's Big-Eared Bat	Y	5	0.95	56%	67%	38%	3,080,173
Pallid Bat	Y	5	0.94	53%	59%	31%	3,614,059
Brazilian Free-Tailed Bat	Y	5	0.94	54%	59%	32%	3,235,278
Snowshoe Hare	Y	5	0.36	72%	81%	58%	114,920
Sonoma Chipmunk	Y	5	0.87	28%	24%	7%	189,424
Long-Eared Chipmunk	Y	5	0.93	64%	96%	61%	1,693,106
Lodgepole Chipmunk	Y	5	0.79	79%	86%	69%	1,711,330
Western Pocket Gopher	Y	5	0.73	47%	43%	20%	15,245
Beaver	Y	5	0.87	59%	80%	47%	1,151,583
Dusky-Footed Woodrat	Y	5	0.93	50%	61%	31%	2,851,275
Elk	Y	5	0.87	51%	17%	9%	677,313
Western Pond Turtle	Y	5	0.94	43%	69%	29%	1,914,285
Western Skink	Y	5	0.83	50%	60%	30%	2,443,820
Western Whiptail	Y	5	0.85	46%	19%	9%	4,194,856
Southern Alligator Lizard	Y	5	0.95	50%	59%	30%	2,570,586
Northern Alligator Lizard	Y	5	0.86	71%	78%	55%	4,999,759
Rubber Boa	Y	5	0.87	65%	89%	58%	4,986,874
Ringneck Snake	Y	5	0.93	38%	34%	13%	1,154,338
Sharp-Tailed Snake	Y	5	0.92	53%	65%	34%	1,914,709
California Whipsnake	Y	5	0.94	55%	60%	33%	1,650,429
California Mountain Kingsnake	Y	5	0.94	59%	75%	44%	3,755,550
Night Snake	Y	5	0.80	48%	28%	13%	1,991,690
Mount Lyell Salamander	Y	6	0.68	88%	90%	80%	1,300,314
Cascade Frog	Y	6	0.68	47%	93%	44%	307,922
Northern Goshawk	S	6	0.95	72%	92%	66%	5,487,523
Blue Grouse	Y	6	0.95	71%	93%	66%	5,634,594
Mountain Quail	S	6	0.90	69%	70%	48%	9,196,892
Calliope Hummingbird	S	6	0.92	72%	76%	55%	4,253,028
Williamson's Sapsucker	S	6	0.76	78%	98%	76%	2,319,686
Hairy Woodpecker	S	6	0.96	70%	96%	67%	6,589,147
Hairy Woodpecker	W	6	0.96	68%	95%	65%	6,932,830
Dusky Flycatcher	S	6	0.93	71%	81%	58%	6,605,768
Clark's Nutcracker	S	6	0.57	81%	95%	76%	1,955,820
Common Raven	S	6	0.94	62%	67%	42%	12,452,319
Mountain Chickadee	S	6	0.96	71%	95%	67%	6,915,448
Red-Breasted Nuthatch	S	6	0.86	69%	98%	68%	5,022,677
Red-Breasted Nuthatch	W	6	0.87	69%	98%	67%	5,342,082
Golden-Crowned Kinglet	S	6	0.92	69%	98%	68%	5,644,843
Golden-Crowned Kinglet	W	6	0.80	68%	91%	61%	6,395,167
Ruby-Crowned Kinglet	S	6	0.88	80%	98%	78%	3,407,784
Hermit Thrush	S	6	0.94	69%	86%	59%	6,297,931
American Robin	S	6	0.94	67%	91%	61%	5,681,363
Yellow-Rumped Warbler	S	6	0.97	72%	91%	66%	7,130,409
Macgillivray's Warbler	S	6	0.17	68%	65%	44%	1,527,555
Wilson's Warbler	S	6	0.94	72%	85%	61%	3,543,670
Green-Tailed Towhee	S	6	0.44	62%	36%	22%	4,698,497
Lincoln's Sparrow	S	6	0.22	70%	87%	61%	820,593
Dark-Eyed Junco	S	6	0.95	73%	82%	60%	7,413,855
Dark-Eyed Junco	W	6	0.95	60%	83%	49%	5,790,641
Cassin's Finch	S	6	0.83	74%	93%	69%	3,673,723
Red Crossbill	S	6	0.87	78%	97%	76%	1,957,647
Red Crossbill	W	6	0.87	70%	97%	68%	3,031,331
Pine Siskin	S	6	0.83	72%	98%	70%	3,188,975
Pine Siskin	W	6	0.83	67%	92%	62%	3,652,890
Dusky Shrew	Y	6	0.61	91%	79%	72%	743,586
Water Shrew	Y	6	0.87	69%	94%	65%	2,281,143
Little Brown Myotis	Y	6	0.94	65%	71%	46%	3,901,688
Silver-Haired Bat	Y	6	0.96	68%	92%	63%	6,083,619

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Species Name	Season	Cluster	Cluster R-squared	FS contribution	Forested % of FS Lands	FS Forest % of Total	Total Habitat
Pika	Y	6	0.78	59%	55%	33%	1,286,842
Yellow-Pine Chipmunk	Y	6	0.95	62%	68%	42%	6,387,736
Allen's Chipmunk	Y	6	0.95	68%	85%	58%	5,012,438
Yellow-Bellied Marmot	Y	6	0.89	65%	62%	41%	3,779,241
Golden-Mantled Ground Squirrel	Y	6	0.95	70%	73%	52%	7,443,576
Douglas' Squirrel	Y	6	0.94	70%	98%	68%	4,258,651
Northern Flying Squirrel	Y	6	0.91	67%	97%	65%	4,261,351
Northern Pocket Gopher	Y	6	0.56	43%	19%	8%	2,399,987
Mountain Pocket Gopher	Y	6	0.64	68%	52%	35%	1,913,322
Deer Mouse	Y	6	0.93	61%	60%	36%	11,755,399
Bushy-Tailed Woodrat	Y	6	0.89	68%	67%	45%	6,075,073
Western Red-Backed Vole	Y	6	0.67	63%	96%	61%	420,281
Heather Vole	Y	6	0.75	88%	76%	67%	737,765
Montane Vole	Y	6	0.94	59%	57%	34%	4,532,284
Long-Tailed Vole	Y	6	0.77	69%	60%	41%	3,758,917
Western Jumping Mouse	Y	6	0.89	75%	83%	62%	2,496,590
Porcupine	Y	6	0.96	66%	80%	53%	7,480,831
Coyote	Y	6	0.93	59%	52%	31%	9,956,432
Red Fox	Y	6	0.70	20%	23%	5%	48,043
Black Bear	Y	6	0.95	70%	84%	58%	5,625,740
Raccoon	Y	6	0.98	63%	75%	47%	7,626,758
Marten	Y	6	0.87	73%	96%	70%	3,562,815
Fisher	Y	6	0.93	92%	99%	90%	672,451
Ermine	Y	6	0.98	70%	88%	62%	4,652,748
Long-Tailed Weasel	Y	6	0.95	60%	62%	37%	8,939,479
Mountain Lion	Y	6	0.93	63%	69%	43%	9,783,351
Bobcat	Y	6	0.92	59%	55%	33%	10,360,863
Mule Deer	Y	6	0.95	63%	65%	40%	9,314,196
Western Terrestrial Garter Snake	Y	6	0.96	59%	68%	40%	8,076,279
Yosemite Toad	Y	7	0.83	96%	82%	79%	322,707
Black-Backed Woodpecker	S	7	0.75	82%	96%	78%	1,017,903
White-Crowned Sparrow	S	7	0.73	89%	30%	26%	532,334
Pine Grosbeak	S	7	0.65	89%	94%	84%	725,882
Mt. Lyell Shrew	Y	7	0.73	80%	75%	60%	27,007
Vagrant Shrew	Y	7	0.65	59%	55%	32%	1,281,837
Alpine Chipmunk	Y	7	0.73	99%	15%	15%	104,437
Uinta Chipmunk	Y	7	0.72	99%	93%	92%	48,491
Wolverine	Y	7	0.67	79%	81%	64%	2,294,101
Black Salamander	Y	8	0.88	49%	39%	19%	47,900
Red-Legged Frog	Y	8	0.90	48%	90%	43%	9,647
California Condor	W	8	0.82	94%	26%	24%	208,421
Band-Tailed Pigeon	W	8	0.88	55%	84%	46%	921,046
White-Throated Swift	W	8	0.88	64%	48%	31%	102,506
Anna's Hummingbird	W	8	0.82	19%	31%	6%	348,192
Nuttall's Woodpecker	Y	8	0.78	41%	56%	23%	844,405
Pacific-Slope	S	8	0.73	52%	85%	44%	1,598,957
Black Phoebe	S	8	0.90	44%	44%	19%	1,053,768
Black Phoebe	W	8	0.90	43%	45%	19%	1,039,697
Cliff Swallow	S	8	0.19	44%	14%	6%	4,658,733
Bushtit	S	8	0.67	51%	30%	15%	3,765,660
Hermit Thrush	W	8	0.87	47%	66%	31%	919,581
Hutton's Vireo	S	8	0.70	39%	63%	25%	933,564
Hutton's Vireo	W	8	0.70	40%	64%	26%	971,852
Orange-Crowned Warbler	W	8	0.85	24%	13%	3%	175,656
Virginia Opossum	Y	8	0.78	41%	55%	23%	1,224,271
Ornate Shrew	Y	8	0.50	45%	49%	22%	631,054
Western Mastiff Bat	Y	8	0.61	40%	26%	10%	674,232
Brush Rabbit	Y	8	0.27	33%	16%	5%	811,898
Wild Pig	Y	8	0.85	26%	37%	10%	444,028
Gilbert's Skink	Y	8	0.21	50%	48%	24%	989,262
Western Aquatic Garter Snake	Y	8	0.87	54%	39%	21%	2,244,528
Speckled Rattlesnake	Y	8	0.85	73%	23%	17%	338,771

4.2.2. Mammals

Mammals inhabit all but the most barren habitats in the Sierra Nevada. Exceeded only by birds in species richness, mammals clearly exhibit the widest variety in body size of the vertebrate groups, ranging from the tiniest shrew to elk. Arguably, mammals also use the widest range of habitats, from valley bottom to mountaintop and from beneath the forest floor to the top of the canopy. Such diversity makes it impossible to generalize about effects of management on mammals. The previous section examines potential effects of the alternatives on a wide range of mammalian species as part of the more inclusive analysis of broad scale trends in terrestrial vertebrates. The following section addresses the effects of alternatives on mule deer, an important game species. The reader is directed to Part 4.3 "Endangered, Threatened and Proposed Species", Part 4.4 "Forest Service Sensitive Species (Focal Species)," and Part 4.5 "Moderate and High Vulnerability Species and Species of Concern," in this chapter, for more details of mammals.

4.2.2.1. MULE DEER (*Odocoileus hemionus*)

I. Affected Environment

Current Trend and Status of the Habitat and Populations

Research suggests that mule deer may be the result of cross breeding between whitetail and blacktail deer. Mule deer inhabit roughly 64 million acres in California. Mule deer range and habitat includes coniferous forest, foothill woodland, shrubland, grassland, agricultural fields, and suburban environments. Suitable habitat is composed of four distinctly different elements: fawning, foraging, cover, and winter range.

Fawning areas are composed of low shrubs or small trees suitable for protection of the doe as she gives birth, and adequate for sheltering the fawn. Fawning areas must be interspersed with forage, hiding cover, and thermal cover for the doe.

Foraging habitat includes brush, shrubs, forbs, grasses, and trees where deer feed most actively at dawn and dusk. Hardwoods, such as oaks, are important for mast production, especially in winter range. Mule deer may also feed on arboreal lichen fallen from large old trees (www.gov.bc.ca/for).

Hiding and thermal cover is typically close to the ground, and thick enough to camouflage the outline of the deer, without being so dense as to obscure the approach of potential predators. Thermal cover is similar and generally thought to be denser, with the additional property of sheltering deer from the elements.

Winter range tends to be lower elevation habitats that meet the requirements for forage, hiding, and thermal cover described above. Mule deer migrate seasonally between higher elevation summer range and low elevation winter range.

Mule deer are a major food source for a number of predators, including mountain lions, bobcats, golden eagles, coyotes, black bears, and domestic dogs. As winter killed carrion, they also provide nutrition for a number of species like wolverine. Deer comprise the principle food source for mountain lions. In the 1980s and 1990s, California had large increases in mountain lion populations. Pressure on the deer populations as a result of mountain lion predation may act to suppress deer numbers.

The Sierra All Species Inventory (Appendix R) assigns mule deer a moderate vulnerability rating for the Sierra Nevada. This rating is based upon three factors: (1) the species is ranked as “common,” with a population that exceeds 10,000 individuals, (refer to population estimates below); 2) the population trend is unknown but suspected to be decreasing; and 3) the range of mule deer in the Sierra Nevada is stable or increasing.

Deer populations have decreased from record highs of the 1950s and 1960s in several areas of the eastern half of the state, with the greatest declines evident in northeastern California and the north and central Sierra Nevada (CDFG 1998). However, record high populations cannot be sustained over the long term because such populations would eliminate the habitat they depend upon, literally eating themselves out of house and home. Population fluctuations are natural and occur as a result of hard winters and other environmental catastrophes (such as drought or floods), changes in predation rates (especially by mountain lions), loss of habitat, and disease.

California may be divided into 11 Deer Assessment Units (DAUs) for purposes of analysis. Six DAUs overlap the planning area for this FEIS to varying degrees: DAUs 2, 3, 4, 5, 6, and 7 (IBID).

Table 4.2.2.1a. Estimated Deer Populations for the Six DAUs in the Sierra Nevada Forest Plan Amendment Project Area (CDFG 1998). These six DAUs total 28,732,160 acres (44,894 square miles).

Deer #'s	DAU						Totals
	2	3	4	5	6	7	
1952 Highs	100,000 ¹	40,000 ²	69,000 ¹	150,000 ¹	65,000 ¹	95,000 ¹	519,000
1952 Density	9.8/ sq mi	11.1/sq mi	9.9/ sq mi	14.3/ sq mi	8.7/ sq mi	10.8/sq mi	11.6/sq mi (=0.018/ac)
1992 Average	25,000	10,000	40,000	70,000	11,500	35,000	191,500
1992 Average Density	2.5/ sq mi	3.1/ sq mi	7.9/ sq mi	6.7/ sq mi	1.5/ sq mi	4.0/ sq mi	4.3/ sq mi (=0.007/ac)

1 Source: Longhurst et al. 1952

2 CDFG 1992 population estimates cited in CDFG (1998)

Key Risk Factors

Forest Service Controlled Risk Factors and Subsidies

Forest Service controlled risk factors for mule deer populations and habitats can be described at landscape and fine scales. In addition, specific Forest Service management activities have beneficial effects on mule deer habitat.

Landscape Scale Risk Factors

- A century of fire exclusion has allowed dense forest canopies to shade out forage and browse species favored by deer.
- Lower levels of timber harvest and associated activities (compared with the 1960s through 1980s) have occurred in recent years. These activities typically open forest canopies for 2 to 30 years following disturbance. These open forest canopies allow the growth of high quality and quantity forage and browse for deer and other early successional species.

Fine Scale Risk Factors

- Herbicide spraying to suppress vegetation that competes with tree regeneration frequently eliminates forage and browse species for deer.

- In spring and summer, livestock graze on forage and browse that deer must rely upon in winter. This limits food resources in the critical winter months and may contribute to deer starvation.

Subsidies

- Prescribed fire for fuels reduction or deer habitat improvement stimulates new growth of species favored for grazing and browsing.
- Timber harvest and associated activities open canopy and stimulate new growth of forage and browse species.

Non-Forest Service Risk Factors and Subsidies

The following points highlight risk factors and subsidies not directly under Forest Service control that can impact mule deer populations and their habitat:

- extensive loss of winter range to urbanization and agricultural development;
- competition with domestic livestock;
- residential development on both slopes of the Sierra Nevada, which effectively limits the potential to restore large-scale disturbances such as fire to the ecosystem (CDFG 1998);
- increased predation by expanded populations of species, such as the mountain lion and feral dogs, where effective methods to control those predators are not available;
- road associated mortality and habitat disruption;
- hunting, both legal and illegal;
- competition with native and non-native wildlife for forage, browse, and mast;
- disease, which tends to increase as deer populations increase; and
- environmental variability (for example hard winters, drought, and flood).

Extent that Forest Service Risk Factors Contribute to Current Condition, Trend or Status of the Habitat or Populations

The Forest Service manages approximately 32.5 percent of deer habitat statewide on a square mile basis (CDFG 1998). The greatest risks--predation, roadkill, urbanization, disease, environmental variability, and hunting--are not within Forest Service control. Quality, quantity, and distribution of suitable fawning, forage, and cover habitats are within Forest Service management control. To the extent that habitat is currently limiting mule deer populations, the Forest Service has the ability to affect their condition, trend, and status.

II. Environmental Consequences

The California Wildlife Habitat Relationships (CWHR) model calculates 2,262,890 acres of existing suitable mule deer habitat on national forest lands in the planning area. This is considerably lower than the DAU figures (CDFG 1998), which sum to over 12 million acres. The DAU acreage's focus strictly on acres managed by the Forest Service, and some of the acres associated with the six DAUs occur outside of the project area boundaries for this FEIS. Additionally, not all of these acres can be expected to provide habitat.

Prescribed fires, as well as low-intensity wildland fires, generate dense understories of shrubs, forbs and grasses that provide deer foraging habitat. Mechanical vegetation treatments, like thinning, biomass, and salvage logging, do not generate these dense understories. It is uncertain whether other logging practices, with or without prescribed fire, have the same effect.

Deer habitat utility scores were calculated based upon CWHR models (Appendix B) for the 2.3 million acres. These scores predict the changes in relative utility of habitats for deer fawning, foraging, cover, and winter range under implementation of the alternatives. This model is limited in that a number of structural and landscape features important to deer are not well evaluated. These features include the number and species of shrubs, shrub foliage volume, and forest openings. The model is also not able to evaluate spatial distribution of habitat elements, such as level of continuity and presence and design of migration corridors. In general, the value and contribution of hardwoods to habitat is not well captured, due mainly to lack of Forest Service inventory data regarding number, location, and distribution of hardwoods across the landscape.

Table 4.2.2.1b. Projected Percent Change in Mule Deer Habitat Utility Scores Over 50 Years as a Result of Implementation of the Alternatives (Appendix B).

Mule Deer	Alternative								
	1	2	3	4	5	6	7	8	Mod 8
Percent Change	-5.9	-6.3	-6.2	-5.6	-6.2	-5.9	-5.8	-6.6	-6.4

Maintaining Habitat Utility

Mule deer habitat utility declines slightly under all alternatives. At a cursory examination, the least declines occur under Alternatives 1, 4, 6, and 7, appearing favorable to early successional species. Alternatives 1 and 4 rely to a great extent upon mechanical treatments to open forest canopies. However, as discussed above, open canopies created by mechanical treatments may not contribute equally to species fitness when compared to openings created by fire. Alternatives 6 and 7 (along with Alternatives 5 and 8) employ a more equitable mix of mechanical and fire treatments to create open canopies. Alternative 2 depends on wildfire and some prescribed burning to generate canopy openings or decrease canopy cover. Alternative 3 focuses on use of fire, with application details determined locally. Alternative Mod. 8 depends to a lesser extent on fire due to the uncertainty obtaining the desired condition. Mod. 8 depends more on mechanical treatment in order to insure minimizing potential changes to canopy closure. Mod. 8 would be providing high levels of forage at the lower elevation within the defense and threat zones.

Sustainability of Foothill Hardwood Habitats

The hardwood component of the deer habitat produces mast for forage, especially important in the low elevation winter ranges. Alternative 1 addresses this habitat component variably across the range, resulting in great uncertainty in its maintenance. Alternatives 2 and 5 largely limit activities to low amounts of prescribed burning; these alternatives have a lower likelihood of opening canopies to a sufficient extent to stimulate hardwood regeneration or allow for successful competition with conifers. Alternatives 5, 6, 7 and 8 have provisions to specifically promote regeneration of montane hardwoods, increasing the likelihood of sustainability. Alternatives 6 and 7 that provide the greatest opportunities for canopy reduction coupled with reforestation guidelines favoring hardwoods. They are the most likely to sustain hardwood ecosystems long term. Mod. 8 emphasizes the maintenance of large hardwood trees while maintaining a good age class distribution for the perpetuation of hardwood species. Mod. 8 recognizes the importance of retaining the mixture of mast producing species where they exist within both foothill hardwood stands and montane hardwood stands.

Spatial Arrangement of Open Canopy Areas

Alternatives 4, 6, 7, 8, and Mod. 8 could begin to “stratify” the landscape with respect to deer foraging opportunities. The strategically placed area fuel treatment strategy in these alternatives

would be implemented on the upper two-thirds of south and west aspects in pine and mixed conifer, which tend to be drier sites. It is possible that predators could learn to preferentially hunt these areas. Alternative 4 also provides for DFPZs, which are typically “linear elements”; DFPZs would provide deer with increased visibility making it more difficult to avoid predators and access cover. Location of DFPZs on ridgetops could help to reduce concentrations of dead and down wood or windfall that might impede deer movement through saddles or across ridges. Open canopies resulting from prescribed fire under Alternative 3 would occur primarily at lower to mid-elevations, with specific levels of canopy cover and design determined locally. This would provide the greatest opportunity to address deer habitats and migration routes using specific local knowledge. Alternative 5 relies heavily on prescribed fire to treat fuel accumulations, and focuses treatment in the urban buffers. This would create the best deer habitat in the closest proximity to humans, resulting in increased potential for conflicts. Mod. 8 emphasizes mechanical treatments within the “defense” and “threat” zones. These areas would exhibit more open canopies via the removal of ladder fuels. These treatment would be scattered across the landscape.

Summary of Effects

Overall, deer habitat utility would be expected to decline under all alternatives. Deer habitat decline varies by only 1 percent between all alternatives (a range of –5.6 to –6.6) over a five-decade period, which is so small that it may be insignificant. Alternative 4 appears to have the highest likelihood of minimizing declines in deer habitat utility.

Since mule deer are a common species still occupying their historic range in the Sierra Nevada, it does not seem likely that the small decline in habitat utility values under any of the proposed alternatives would outweigh either natural environmental variations or risk factors beyond the control of the Forest Service to result in the loss of viable, well-distributed populations.

4.2.3. Birds (Abstracted from Hejl 2000)

The Sierra Nevada avifauna is highly diverse due to a great number of different habitats over a large elevational gradient. This diverse avifauna is composed of year-round residents, breeding species, winter visitors, and migrants.

Sierra Nevada birdlife changes dramatically from one season to the next. In the spring, migrants are found at lower and middle elevations; they are either passing through as they travel further north to breed or lingering at lower elevations until conditions for breeding improve upslope. Many foothill birds have finished breeding by the beginning of summer, while middle and higher elevation birds spend much of the summer raising young. As the fledgling period ends (late June in the foothills to early August at high elevations), bird species often become less particular in their choice of habitats. Many species group into foraging flocks. As the nesting season concludes, migration begins in earnest with some species migrating in the summer and others in the fall. In the fall, bird distribution and numbers change daily in Sierra Nevada habitats as migrants pass through. Most winter visitors have arrived by the end of September; many occupy areas above their winter range. As adult insects become scarce, insectivorous birds leave the Sierras and other birds switch to other food sources (for example acorns, fruit, and insect larvae). When the first big snows hit the Sierras, many birds move down slope to areas where they will spend the winter. Woodpeckers, kinglets, nuthatches, and chickadees are among the few species that spend the winter in the higher, snowbound elevations. Most species spend the winter at elevations below the snow.

Most breeding birds in the Sierra Nevada are found in certain habitats and in restricted elevational zones. Optimal elevational zones for most species consist of a few thousand feet, but some species are widely distributed throughout the range, and others are restricted to a particular habitat. As described above, a species' optimal zone often changes with the season. The general elevational trend in habitats from west to east is: grasslands, blue oak woodlands and chaparral at the lower elevations on the western slope; ponderosa pine, mixed conifer, montane hardwood, montane chaparral, and red fir forests at the middle elevations on the western slope; subalpine and alpine zones at the higher elevations on both sides of the crest; Jeffrey pine, red fir, and montane chaparral at middle elevations on the eastern slope; and pinyon pine, juniper, and sagebrush at the lower elevations on the eastern slope. Special habitats occur across a wide range of vegetation zones and provide key resources for Sierra Nevada birds. These special habitats are: lakes, marshes, rivers, riparian forests, meadows, rocks, and cliffs.

Two hundred and seventy existing bird species have distributional ranges that substantively overlap the Sierra Nevada Forest Plan Amendment Project planning area (Appendix R). For convenience, bird species have been subdivided into habitat association groups for this analysis. In addition, the California spotted owl, northern goshawk, and willow flycatcher are discussed in considerable detail in later parts of this chapter.

4.2.3.1. Terrestrial Land Birds

Moderate and Low Vulnerability Bird Species

I. Affected Environment

Terrestrial land birds are defined here as species that primarily use upland terrestrial environments. Two of the terrestrial land birds are classified in the high vulnerability group, 48 are in the moderate vulnerability group, and 86 are in the low vulnerability group (Appendix R, Table R.3).

Twenty-eight percent of the birds optimally use all three general habitats (conifer, montane hardwoods, and blue oak woodlands) and 19 percent optimally use only blue oak woodlands. The rest of the terrestrial birds are fairly equally divided among those that use only conifer forests, those that use both conifer forests and montane hardwoods, those that use conifer forests and blue oak woodlands, and those that use montane hardwoods and blue oak woodlands. No species specializes only in montane hardwoods.

II. Environmental Consequences

A. Assumptions

Forest management practices, including mechanical treatments and the absence of wildfire, can adversely affect conifer forest bird species. In general, bird species associated with specific stand ages and structures; for example, mature forest, open forest, are likely to be affected similarly by different kinds of treatments (mechanical treatments, prescribed fire, and wildfire) as described in the following paragraphs. Most studies have addressed effects of timber harvest: many studies have evaluated effects of clearcutting on conifer forest bird species while few have evaluated other kinds of treatments. Few studies have addressed effects of wildfire and salvage logging, and almost none have evaluated prescribed fire effects.

Most of the bird species associated with moderate to dense mature forests and dense forests of all ages would not use forests modified by DFPZs, most CASPO interim guideline prescriptions, or stand-replacing wildfire (in the short term). Prescribed fire would not be likely to modify their habitat and some bird species might use wildfire mosaics.

Bird species associated with sparse to open mature forests would likely use areas treated with prescribed fire and mechanical treatments (DFPZ, CASPO interim guideline prescriptions, and thinning); some species might also use stands burned by stand replacing wildfire. How these species would respond to salvage logging in post-fire forests is unknown; however, it is likely that each species would use salvage-logged areas in different conditions. For example, some species would use areas that had not been salvage logged while others would use areas that contained a few snags per acre.

A concern about use of CWHR habitat projections is that it is not known whether open habitat created by logging is as beneficial for species as open habitat created by fire.

B. Measures Used to Assess Environmental Consequences

Differential effects of the alternatives on terrestrial land birds were evaluated by examining: (1) future changes in the total amount of all habitats units and (2) future changes in specific habitat structural types. CWHR habitat units were estimated for all species as described in Part 4.1 of this

chapter. Bird species were further subdivided according to optimal habitats used in this section, Part 4.2.3.1.

The alternatives proposed different treatments in conifer forests, montane hardwood forests, and blue oak woodlands; hence, bird species were classified by habitat to determine if utilization scores differed among species that optimally use one habitat or another. Species were grouped according to the habitat type (conifer, montane hardwood, and blue oak woodlands) of optimal use based on CWHR scores (see Appendix R). In addition, because treatments are expected to affect species associated with different structural stages in different ways, the land bird species were also grouped according to the structural stages they optimally use.

C. Effects of the Alternatives on Terrestrial Land Birds

To differentiate among alternatives, changes between current and future habitat estimates were subdivided into conifer and montane hardwood contributions for 142 species (Table 4.2.3.1a). Slightly more than half of the species have the same or more projected conifer habitat in the future. Approximately one-quarter of the species have less conifer habitat in the future. In contrast, most species have the same or more montane hardwood habitat in the future.

Table 4.2.3.1a. Number of land bird species (of 142) with more (+), similar (~), or less (-) conifer (CON) or montane hardwood (MHD) habitat units in 50 years under each alternative.

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Mod 8
+ con	18	12	18	18	15	16	15	13	21
~ con	63	41	56	61	57	58	61	61	55
- con	11	39	18	13	20	18	16	18	16
+ mhd	14	10	14	13	13	12	12	10	17
~ mhd	56	37	54	55	51	55	55	55	45
- mhd	4	27	6	6	10	7	7	9	12
+ con and + mhd	11	7	13	12	10	11	10	8	14
~con and ~mhd	50	34	46	48	47	47	49	49	41
- con and - mhd	2	22	4	3	6	5	4	6	8

Table 4.2.3.1b. Average relative changes in habitat units (in percent) for land birds with optimal habitat in each combination of vegetation and age or structural stage

Vegetation	Age/Structure	N	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Mod 8
Blue Oak Woodlands	Mature	17	10.2	-4.4	5.4	8.3	7.3	3.3	3.9	2.5	9.5
	Mature/Closed	4	0.3	-7.6	6.2	6.2	-2.3	3.8	1.2	-3.2	6.4
	Mature/Open	7	-4.4	-13.1	-8.9	-8.2	-9.0	-10.3	-7.7	-8.7	-7.5
	Open	18	13.7	5.8	3.5	2.0	7.2	1.6	4.1	6.7	9.4
	Closed	3	3.2	-4.9	0.3	0.0	-1.4	-1.6	-0.8	-1.8	2.9
	All	26	9.2	-0.5	4.9	5.3	6.2	3.1	3.0	2.7	5.9
	Other	11	130.1	123.8	126.7	123.4	127.0	124.6	125.3	126.0	109.5
	Combined	7	23.2	14.1	19.7	19.6	19.3	17.8	18.4	17.7	19.4
Conifer	Mature	29	9.6	-3.3	6.6	10.2	5.6	5.1	4.8	2.3	8.5
	Mature/Closed	11	11.4	0.8	15.2	15.4	5.7	13.9	9.7	4.6	8.5
	Mature/Open	4	-5.9	-14.3	-9.8	-11.0	-13.8	-9.9	-9.3	-10.1	-5.8
	Open	17	115.8	104.8	102.1	102.7	111.7	100.8	102.2	106.5	97.4
	Closed	4	3.6	-4.1	7.4	6.9	1.1	5.7	4.0	-0.8	3.9
	All	19	-3.1	-10.2	-4.1	-4.2	-6.9	-5.1	-5.9	-10.0	-4.6
	Other	8	-7.7	-14.0	-13.6	-15.6	-14.2	-13.3	-13.9	-13.5	-1.35
	Combined	7	17.7	8.6	14.8	14.9	12.7	13.9	13.1	11.6	15.1
Montane Hardwood	Mature	21	10.4	-3.7	6.9	10.6	7.6	4.9	5.1	2.6	9.8
	Mature/Closed	8	8.3	-2.0	12.5	13.6	3.1	10.9	7.8	2.1	7.4
	Mature/Open	4	3.5	-6.6	-1.7	0.7	-1.1	-4.5	0.7	-3.0	-0.4
	Open	13	13.2	5.0	3.0	4.5	7.4	2.1	4.9	5.8	9.4
	Closed	7	6.8	-1.2	8.7	8.0	3.8	6.4	4.9	1.6	7.1
	All	18	12.8	1.3	6.8	8.2	9.5	5.0	4.8	5.0	9.3
	Other	3	-1.0	-8.5	-3.6	-1.5	-5.1	-4.2	-3.7	-6.2	-1.4
	Combined	7	0.7	-2.2	4.7	6.3	3.5	2.9	3.5	1.1	5.9

Effects to conifer associated forest birds

Total habitat units. Except for Alternative 2, the remaining alternatives behave similarly in trends for total conifer habitat. Of the 92 bird species that use only conifer forests, 12 to 21 are predicted to have more habitat units in the future. Alternative 1 would see the least number of species experience declines in habitat units (11) while Alternative 2 is predicted to have the most (39). Modified Alternative 8 would benefit the most species (Table 4.2.3.1a).

Habitat units by structure. For the 92 conifer forest birds, relative changes in habitat vary among age and structural stage associations (Table 4.2.3.1b). Positive trends occur across all alternatives for the mature and the closed mature species. The greatest negative effects are seen for birds associated with mature open forests and other forests. Mature open forest species are predicted to have from 5.9 percent to 14.3 percent less habitat units, with Alternatives 2 and 8 showing the least amount of decline. Under all of the alternatives, numbers of large trees are expected to increase; denser forests comprised of larger trees are also expected to increase.

Effects to montane hardwood and conifer associated forest birds

Historically, wildfire was likely beneficial for most montane hardwood bird species because it opened stands and encouraged montane hardwood regeneration. Because some species require dense stand conditions, it is best if wildfire does not affect all stands at the same time. These potential losses could result from many different scenarios (Part 3.3 “Hardwood Ecosystems” of this chapter). Stand replacing and mixed intensity wildfires could decrease the current amount of “old-growth” montane hardwood forest. Since prescribed fire usually opens forest canopies and forest floors, thereby encouraging regeneration, it likely benefits most species, except those closely associated with the densest canopies and forest floors. Mechanical treatments might mimic either wildfire or prescribed fire depending on how many trees, snags, and logs, especially hardwoods, are retained. Loss of snags

and downed logs through fuelwood collection would negatively affect many species by removing nesting, roosting, and foraging structures.

Total habitat units. Out of 63 of bird species that use montane hardwood forests and conifer forests 7 to 14 are predicted to see increases in habitat units under all alternatives (Table 4.2.3.1a). . The majority will see no changes except under Alternative 2 where a large number (22) species see declines in habitat units. Modified Alternative 8 would see the greatest number of species benefit from increased habitat units in 50 years.

Habitat units by structure. For the 74 birds associated at least in part with montane hardwood forests habitat trends would vary by stand age and structural stage (Table 4.2.3.1b). Like with conifer forests, positive trends occur across all alternatives for bird species associated with mature, closed mature open, with the exception of Alternative 2. The greatest increases are predicted in Alternatives 3, 4, and 6. Open mature habitat declines under all alternatives except for Alternative 1, 4, and 7; however, in general open habitat of all size classes is predicted to increase under all alternatives.

Effects to blue oak woodland associated birds

The greatest threat for bird species associated with blue oak woodlands is the loss of blue oak woodlands. This loss has many possible causes including lethal and mixed lethal wildfire, competition from annual plants, grazing, thinning, and fuelwood gathering. Grazing, thinning, and fuelwood gathering are three factors that vary between the alternatives. Each of these factors could cause a decline in tree recruitment in blue oak woodlands. In addition, loss of trees, snags, and down logs through fuelwood collection and mechanical treatments and loss of shrubs through grazing and mechanical treatments could negatively affect many species by removing nesting, roosting, and foraging structures.

The following factors were used to assess the consequences of the alternatives on bird species associated with blue oak woodlands: (1) grazing, (2) maintaining mature and open forests in blue oak woodlands, and (3) urban-wildland intermix zones.

Grazing

Grazing could directly affect recruitment of blue oaks (evidence both supports and contradicts this hypothesis). In addition, grazing may directly affect the number of shrub-nesting birds by decreasing numbers of shrubs and may indirectly affect the nesting success of open-cup nesting species through increased cowbird parasitism. (Cowbirds associate with cattle to obtain supplemental food.) In addition, cows may facilitate European starling expansion in the foothills. This could indirectly affect secondary cavity nesters as European starlings occupy potential nest sites. All alternatives would impose some grazing standards for maintenance and enhancement of blue oak woodlands.

Maintaining mature and open forests in blue oak woodlands

Twenty-six percent of the bird species use mature blue oak woodlands and 38 percent use open forests. None of the action alternatives (Alternatives 2 through Modified 8) maintain mature open blue oak woodlands. However, all action alternatives maintain or increase open habitat in blue oak woodlands. Therefore, these species are projected to have more habitat under any of the action alternatives.

Urban-Wildland Intermix Zones

Shrubs and smaller trees in urban wildland intermix zones would be removed for fire protection. This would affect habitat for birds that nest and forage in shrubs and small trees. Urban wildland intermix zones constitute up to 50 percent of the foothill woodlands in the planning area. Alternatives 2, 5 and Modified 8 would have the least amount of blue oak woodland in the urban buffer.

Table 4.2.3.1c. Consequences of Alternatives on Bird Species.

CWHR ID	Common Name	Conifer	Montane Hardwoods	Blue Oak Woodlands	Changes in Habitat Utilization Values (all values in percent)										
					Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Mod 8	Average	Min level treatment
B108	Turkey Vulture	all	all	all	-2.10%	-6.90%	-4.80%	-5.80%	-5.30%	-5.10%	-5.50%	-5.30%	-4.10%	-5.0%	-5.5%
B109	California Condor	all	all	all	2.00%	-0.60%	11.70%	8.10%	5.40%	10.30%	6.30%	0.00%	5.70%	5.4%	-0.7%
B110	Osprey	mature	mature		-2.00%	-9.70%	0.30%	1.60%	-5.80%	-0.90%	-2.00%	-6.20%	-1.10%	-2.9%	-11.8%
B111	White-Tailed Kite			mature	-42.50%	-42.60%	-42.60%	-42.60%	-42.60%	-42.50%	-42.50%	-42.50%	-39.80%	-42.2%	-42.5%
B113	Bald Eagle	mature			35.80%	20.00%	31.80%	39.00%	28.70%	30.30%	27.70%	26.30%	28.60%	29.8%	17.7%
B114	Northern Harrier				111.40%	96.30%	47.10%	24.60%	87.70%	46.30%	44.40%	77.20%	83.50%	68.7%	136.3%
B115	Sharp-Shinned Hawk	closed	closed	all	1.80%	-5.50%	4.30%	4.40%	-1.40%	2.70%	1.10%	-2.30%	2.00%	0.8%	-6.9%
B116	Cooper's Hawk		closed	closed	-1.60%	-8.60%	1.40%	0.80%	-4.40%	-0.10%	-2.00%	-5.30%	-0.40%	-2.2%	-10.1%
B117	Northern Goshawk	closed mature	closed mature		2.50%	-5.40%	6.40%	6.40%	-1.40%	4.70%	2.20%	-2.20%	3.70%	1.9%	-8.0%
B119	Red-Shouldered Hawk			closed mature	-25.00%	-24.20%	-14.90%	-16.40%	-22.50%	-18.40%	-18.20%	-21.00%	2.90%	-17.5%	-25.2%
B121	Swainson's Hawk	open mature		mature	-11.60%	-24.60%	-15.20%	-30.90%	-29.10%	-15.50%	-17.40%	-13.40%	-14.70%	-19.2%	-9.9%
B123	Red-Tailed Hawk	mature	mature	mature	-3.90%	-11.40%	-4.20%	-3.40%	-7.80%	-5.20%	-5.70%	-8.30%	-3.70%	-6.0%	-11.8%
B126	Golden Eagle	all	all	all	0.70%	-6.50%	-3.10%	-2.60%	-3.60%	-4.10%	-4.20%	-5.00%	-1.10%	-3.3%	-5.1%
B127	American Kestrel	mature	mature	mature	3.80%	-6.50%	3.20%	4.00%	-1.40%	1.60%	0.20%	-2.60%	1.60%	0.4%	-7.2%
B129	Peregrine Falcon	all	all	all	4.00%	-3.10%	1.50%	2.10%	0.00%	0.30%	-0.30%	-1.40%	3.80%	0.8%	-2.6%
B131	Prairie Falcon	all	all	all	-1.00%	-7.20%	-4.40%	-5.30%	-4.50%	-5.30%	-7.30%	-5.90%	-2.40%	-4.8%	-5.0%
B134	Blue Grouse	mature			12.30%	1.10%	10.00%	12.70%	8.10%	8.60%	7.40%	5.30%	12.40%	8.7%	1.3%
B140	California Quail			all	-1.30%	-9.30%	-4.00%	-4.90%	-5.50%	-5.20%	-5.60%	-6.60%	-4.00%	-5.2%	-8.1%
B141	Mountain Quail	open	open	all	-1.30%	-7.70%	-3.20%	-2.80%	-4.80%	-4.20%	-4.60%	-5.70%	-0.80%	-3.9%	-7.0%
B251	Band-Tailed Pigeon	mature	mature	closed mature	0.10%	-10.90%	3.00%	4.70%	-4.40%	1.00%	-1.50%	-6.50%	-0.80%	-1.7%	-13.9%
B255	Mourning Dove	other	other	other	-0.60%	-9.70%	-4.40%	-0.20%	-5.30%	-4.50%	-2.50%	-6.20%	-3.20%	-4.1%	-10.0%
B262	Barn Owl	open	all	all	229.90%	146.30%	130.20%	148.30%	226.20%	118.40%	127.00%	163.30%	185.40%	163.9%	200.7%
B263	Flammulated Owl	mature	mature		-2.30%	-11.00%	-2.80%	-0.80%	-6.70%	-3.90%	-4.00%	-7.70%	-1.90%	-4.6%	-12.0%
B264	Western Screech-Owl		all	all	-3.20%	-10.30%	-2.20%	-2.60%	-5.60%	-3.70%	-4.20%	-6.70%	-3.90%	-4.7%	-10.5%
B265	Great Horned Owl	mature	mature	mature	-4.70%	-12.60%	-5.20%	-2.50%	-8.80%	-6.00%	-5.40%	-9.10%	-3.90%	-6.5%	-13.7%
B267	Northern Pygmy-Owl	mature	mature	mature	-4.50%	-14.00%	-4.50%	-1.80%	-9.30%	-5.50%	-5.50%	-9.30%	-4.70%	-6.6%	-15.1%
B269	Burrowing Owl	other		other	-28.70%	-34.70%	-29.20%	-42.40%	-37.60%	-29.00%	-33.60%	-29.30%	-35.30%	-33.3%	-28.6%
B270	Spotted Owl	closed mature	closed mature	closed mature	26.90%	13.40%	35.20%	34.90%	22.00%	32.30%	25.90%	19.70%	23.60%	26.0%	7.4%
B271	Great Gray Owl	closed mature			33.60%	15.40%	37.20%	33.50%	21.70%	37.40%	30.40%	19.30%	25.10%	28.2%	14.2%
B272	Long-Eared Owl			closed	0.10%	-4.30%	3.50%	4.00%	-0.40%	2.80%	2.70%	-0.50%	-0.90%	0.8%	-6.2%
B274	Northern Saw-Whet Owl	closed mature	closed mature	closed mature	-0.90%	-8.50%	1.60%	1.50%	-4.30%	0.20%	-1.60%	-5.10%	-0.20%	-1.9%	-10.2%
B275	Lesser Nighthawk	all		all	-33.70%	-33.80%	-33.80%	-44.10%	-33.80%	-33.80%	-39.70%	-34.40%	-38.50%	-36.2%	-33.7%
B276	Common Nighthawk	open	open	all	90.50%	83.90%	79.70%	81.00%	85.60%	79.50%	81.10%	83.40%	75.30%	82.2%	88.1%
B277	Common Poorwill	open		open	1.00%	-6.80%	-7.50%	-10.00%	-3.20%	-8.80%	-9.00%	-5.30%	-3.10%	-5.9%	-1.4%
B279	Black Swift	all	all		5.00%	-4.80%	1.00%	2.50%	-0.50%	-0.60%	-1.60%	-3.60%	7.30%	0.5%	-4.0%
B281	Vaux's Swift				13.70%	1.80%	10.30%	11.80%	9.00%	8.20%	6.40%	4.70%	9.00%	8.3%	1.5%

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CWHR ID	Common Name	Conifer	Montane Hardwoods	Blue Oak Woodlands	Changes in Habitat Utilization Values (all values in percent)										Average	Min level treatment
					Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Mod 8			
B282	White-Throated Swift	all	all	all	5.70%	-1.90%	4.20%	3.90%	2.30%	2.50%	1.90%	-0.20%	4.60%	2.6%	-1.8%	
B286	Black-Chinned Hummingbird			open mature	-14.70%	-19.60%	-11.70%	-18.60%	-17.20%	-11.20%	-11.90%	-10.40%	-13.60%	-14.3%	-15.9%	
B287	Anna's Hummingbird			open	5.70%	-10.00%	-12.50%	2.80%	-6.90%	-11.30%	-2.20%	-8.30%	-4.00%	-5.2%	-7.5%	
B289	Calliope Hummingbird	open	open		-4.20%	-15.70%	-20.70%	-11.80%	-13.70%	-20.50%	-14.90%	-14.50%	-5.00%	-13.4%	-11.6%	
B290	Broad-Tailed Hummingbird				-24.00%	-29.40%	-27.40%	-38.00%	-28.60%	-27.80%	-36.30%	-29.50%	-33.50%	-30.5%	-29.7%	
B294	Lewis's Woodpecker	mature	mature	open mature	-8.10%	-17.60%	-11.80%	-8.10%	-14.30%	-11.70%	-12.60%	-12.00%	-8.60%	-11.6%	-16.4%	
B296	Acorn Woodpecker	all	mature	mature	1.10%	-6.70%	1.20%	3.80%	-0.30%	-0.20%	0.50%	-2.80%	-2.20%	-0.6%	-8.0%	
B299	Red-Breasted Sapsucker	open mature	open mature	all	-1.00%	-10.20%	-3.50%	0.10%	-5.80%	-4.20%	-3.40%	-6.50%	-1.30%	-4.0%	-10.5%	
B300	Williamson's Sapsucker	mature			-3.80%	-13.10%	-5.00%	1.00%	-10.90%	-5.00%	-5.30%	-9.70%	-3.00%	-6.1%	-15.8%	
B302	Nuttall's Woodpecker		mature	all	-17.90%	-19.30%	-8.00%	-10.20%	-14.80%	-9.60%	-10.50%	-16.40%	-2.00%	-12.1%	-20.6%	
B303	Downy Woodpecker			open mature	-1.30%	-11.70%	-4.20%	-0.20%	-5.10%	-5.20%	-4.80%	-6.60%	-4.10%	-4.8%	-11.4%	
B304	Hairy Woodpecker	mature	mature	mature	-2.20%	-10.50%	-2.80%	0.90%	-6.60%	-3.40%	-3.00%	-6.90%	-2.00%	-4.1%	-12.0%	
B305	White-Headed Woodpecker	mature			-4.60%	-13.10%	-5.00%	-0.90%	-9.60%	-5.30%	-4.80%	-9.50%	-2.90%	-6.2%	-15.0%	
B306	Black-Backed Woodpecker	mature			-1.50%	-5.70%	-2.80%	-2.60%	-4.50%	-3.20%	-4.30%	-5.50%	1.50%	-3.2%	-7.2%	
B307	Northern Flicker	mature	mature	mature	1.40%	-7.60%	0.80%	3.60%	-3.20%	-0.10%	-0.10%	-3.60%	1.20%	-0.8%	-8.7%	
B308	Pileated Woodpecker	closed mature	closed mature		22.80%	10.10%	29.30%	31.10%	17.60%	27.80%	23.00%	15.70%	17.50%	21.7%	3.7%	
B309	Olive-Sided Flycatcher	mature	mature		12.20%	0.40%	11.90%	12.60%	6.60%	9.70%	7.10%	3.70%	9.90%	8.2%	-0.9%	
B311	Western Wood-Pewee	mature	mature	mature	-2.40%	-9.30%	-1.30%	-0.90%	-5.80%	-2.50%	-3.50%	-6.40%	-1.70%	-3.8%	-10.3%	
B317	Hammond's Flycatcher	mature	closed mature		13.80%	2.60%	20.10%	19.40%	7.10%	18.10%	12.10%	5.90%	13.00%	12.5%	-1.8%	
B318	Dusky Flycatcher	other	other		-5.10%	-11.80%	-8.20%	-5.10%	-9.60%	-8.50%	-7.50%	-10.00%	-4.10%	-7.8%	-12.1%	
B319	Gray Flycatcher	other			10.10%	4.80%	-19.20%	-23.50%	-10.20%	-14.30%	-11.90%	-8.40%	-6.60%	-8.8%	14.3%	
B320	Pacific-Slope Flycatcher	closed	closed	closed	9.70%	1.30%	17.40%	14.00%	10.10%	15.10%	13.10%	5.10%	10.10%	10.7%	-2.3%	
B321	Black Phoebe				-1.40%	-6.70%	2.40%	-2.00%	0.80%	-1.40%	-2.60%	-3.50%	-4.40%	-2.1%	-7.3%	
B323	Say's Phoebe	other		other	-35.00%	-35.10%	-35.10%	-46.80%	-35.10%	-35.20%	-41.80%	-35.20%	40.60%	-28.7%	-35.0%	
B326	Ash-Throated Flycatcher		open	open mature	-3.40%	-9.20%	-5.30%	-12.90%	-6.40%	-8.80%	-8.80%	-5.60%	-12.80%	-8.1%	-5.8%	
B333	Western Kingbird		open	open	-14.60%	-22.60%	-18.10%	-25.00%	-22.20%	-19.00%	-21.10%	-18.40%	-24.20%	-20.6%	-15.0%	
B338	Purple Martin	mature	mature	mature	250.70%	119.80%	158.80%	201.30%	262.40%	143.30%	156.90%	176.50%	233.10%	189.2%	157.6%	
B339	Tree Swallow				-7.90%	-10.60%	-2.50%	-4.70%	-6.00%	-4.30%	-5.60%	-6.50%	-5.10%	-5.9%	-12.8%	
B340	Violet-Green Swallow	mature	mature	mature	-1.00%	-11.60%	-1.70%	1.00%	-6.40%	-3.00%	-2.90%	-8.00%	-1.40%	-3.9%	-12.9%	
B341	Northern Rough-Winged Swallow	all	all	all	-4.90%	-9.40%	-4.40%	-9.30%	-6.10%	-6.20%	-7.30%	-6.50%	-7.80%	-6.9%	-7.8%	
B343	Cliff Swallow			open	79.00%	65.90%	45.40%	45.40%	63.30%	30.60%	55.70%	54.10%	60.70%	55.6%	76.9%	
B344	Barn Swallow	open	open	open	8.50%	-6.30%	-4.20%	-0.30%	-1.10%	-5.60%	-4.90%	-4.10%	1.70%	-1.8%	-0.8%	

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B345	Gray Jay	closed mature			18.60%	17.00%	20.50%	18.00%	17.30%	20.10%	10.80%	18.40%	5.80%	16.3%	16.9%
B346	Steller's Jay	closed	closed		0.60%	-6.50%	2.10%	2.50%	-2.80%	0.80%	-0.60%	-3.70%	1.20%	-0.7%	-7.9%
B348	Western Scrub-Jay			other	-9.00%	-16.60%	-7.20%	-15.60%	-12.20%	-10.60%	-11.00%	-9.70%	-16.70%	-12.1%	-13.7%
B349	Pinyon Jay	mature			-19.00%	-22.50%	-15.20%	-22.80%	-22.80%	-15.40%	-17.90%	-16.00%	-20.10%	-19.1%	-20.2%
B350	Clark's Nutcracker	mature			-1.80%	-3.90%	1.00%	3.20%	-2.70%	1.20%	1.00%	-1.00%	0.00%	-0.3%	-6.2%
B353	American Crow			mature	-14.70%	-14.30%	-10.50%	-12.00%	-13.60%	-12.80%	-11.70%	-12.50%	1.10%	-11.2%	-15.0%
B354	Common Raven	other	other	other	2.70%	-4.10%	1.80%	0.90%	-0.40%	0.30%	-1.10%	-2.30%	3.00%	0.1%	-3.9%
B356	Mountain Chickadee	all	all		-4.40%	-11.50%	-4.30%	-0.70%	-8.80%	-4.60%	-4.30%	-8.50%	-3.30%	-5.6%	-13.3%
B357	Chestnut-Backed Chickadee				7.60%	-3.30%	7.60%	6.20%	4.70%	4.20%	1.20%	0.30%	3.80%	3.6%	-4.3%
B358	Oak Titmouse	mature	mature	mature	14.60%	11.90%	19.40%	17.90%	18.80%	15.60%	16.30%	16.50%	5.10%	15.1%	10.8%
B360	Bushtit			other	-4.30%	-14.00%	-2.90%	-9.80%	-6.90%	-5.40%	-9.30%	-9.20%	-7.20%	-7.7%	-12.0%
B361	Red-Breasted Nuthatch	mature			4.20%	-5.00%	6.50%	8.90%	-1.30%	5.60%	3.90%	-1.30%	3.80%	2.8%	-8.2%
B362	White-Breasted Nuthatch	mature	mature	mature	-3.70%	-10.60%	-0.50%	1.10%	-6.80%	-2.00%	-3.20%	-6.80%	-1.40%	-3.8%	-12.6%
B363	Pygmy Nuthatch	mature			-0.90%	-10.20%	2.30%	5.80%	-6.30%	1.50%	1.00%	-5.60%	-0.70%	-1.5%	-13.2%
B364	Brown Creeper	closed mature	closed mature		0.90%	-7.10%	5.40%	7.40%	-3.90%	4.70%	2.60%	-3.40%	1.70%	0.9%	-10.9%
B366	Rock Wren	open	all	all	8.50%	2.70%	13.20%	10.40%	13.30%	8.40%	7.90%	8.70%	-1.00%	8.0%	2.5%
B368	Bewick's Wren	all		all	-15.10%	-24.20%	-22.30%	-27.40%	-25.30%	-23.10%	-21.20%	-19.90%	-28.90%	-23.0%	-18.8%
B369	House Wren			all	2.60%	-1.20%	5.00%	3.20%	4.70%	1.70%	2.30%	2.20%	-1.40%	2.1%	-1.3%
B370	Winter Wren	closed mature	closed		19.50%	6.30%	27.50%	24.20%	12.10%	25.00%	17.10%	10.10%	15.90%	17.5%	1.2%
B375	Golden-Crowned Kinglet	closed mature	closed mature		1.00%	-6.90%	2.40%	4.70%	-3.90%	1.70%	0.70%	-4.10%	0.60%	-0.4%	-9.4%
B376	Ruby-Crowned Kinglet	all	all	all	0.60%	-6.10%	-1.10%	2.30%	-4.00%	-1.60%	-1.10%	-3.80%	0.40%	-1.6%	-6.5%
B377	Blue-Gray Gnatcatcher			open	-15.60%	-22.90%	-15.60%	-25.60%	-22.40%	-16.50%	-18.60%	-16.00%	-25.10%	-19.8%	-17.4%
B380	Western Bluebird		open mature	open mature	-8.20%	-20.90%	-18.20%	-8.00%	-16.60%	-17.60%	-10.50%	-16.60%	-8.90%	-13.9%	-20.8%
B381	Mountain Bluebird	open		open	213.80%	209.30%	201.40%	200.00%	211.40%	198.50%	200.40%	209.90%	227.90%	208.1%	217.5%
B382	Townsend's Solitaire	other	all		-6.90%	-15.90%	-9.70%	-4.40%	-12.80%	-10.00%	-8.60%	-12.70%	-5.30%	-9.6%	-17.3%
B385	Swainson's Thrush				4.20%	-4.60%	11.30%	10.70%	0.70%	9.30%	4.80%	-0.60%	5.50%	4.6%	-8.5%
B386	Hermit Thrush	closed	closed	all	2.30%	-5.50%	5.60%	6.70%	-1.50%	4.00%	2.30%	-2.20%	2.40%	1.6%	-8.0%
B389	American Robin	open	open	open	-3.70%	-11.80%	-9.70%	-6.20%	-9.20%	-10.10%	-7.90%	-9.80%	-4.70%	-8.1%	-10.6%
B391	Wrentit		closed	other	15.50%	10.10%	2.70%	3.10%	14.80%	-2.80%	3.10%	9.20%	18.50%	8.2%	16.8%
B393	Northern Mockingbird			open	-33.20%	-33.30%	-33.30%	-43.10%	-33.30%	-33.30%	-38.80%	-34.10%	-37.90%	-35.6%	-33.2%
B398	California Thrasher				43.10%	77.50%	33.20%	20.20%	5.30%	41.90%	44.20%	36.20%	35.20%	37.4%	87.3%
B408	Phainopepla			open mature	-14.70%	-23.30%	-18.90%	-15.90%	-17.10%	-17.90%	-19.00%	-22.00%	-11.70%	-17.8%	-17.5%
B410	Loggerhead Shrike	open		open	-24.40%	-30.50%	-27.40%	-40.70%	-33.20%	-28.30%	-32.70%	-26.50%	-29.40%	-30.3%	-23.7%
B415	Plumbeous Vireo	all	all	open	1.30%	-8.60%	1.30%	-0.40%	-6.10%	0.70%	-0.90%	-1.60%	-1.90%	-1.8%	-9.1%
B417	Hutton's Vireo		open mature	other	3.20%	-5.70%	7.40%	4.40%	4.50%	3.80%	3.20%	-1.10%	1.70%	2.4%	-5.6%
B418	Warbling Vireo	all	mature	all	-5.80%	-16.10%	-8.50%	-3.10%	-10.80%	-9.30%	-7.00%	-11.90%	-5.00%	-8.6%	-17.3%
B426	Nashville Warbler	open	open		-11.60%	-18.60%	-15.20%	-12.40%	-15.80%	-16.00%	-13.90%	-17.50%	-10.00%	-14.6%	-18.0%

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B427	Virginia's Warbler				-30.00%	-32.80%	-30.80%	-41.60%	-32.00%	-30.40%	-43.30%	-30.80%	-31.90%	-33.7%	-32.6%
B430	Yellow Warbler	all		all	-9.10%	-17.20%	-10.30%	-6.90%	-13.60%	-11.20%	-10.80%	-14.80%	-9.30%	-11.5%	-18.0%
B435	Yellow-Rumped Warbler	all	all	all	-2.90%	-10.40%	-4.10%	-2.00%	-7.20%	-4.90%	-5.10%	-7.40%	-2.60%	-5.2%	-10.9%
B436	Black-Throated Gray Warbler	all	all	all	3.60%	-7.10%	2.80%	4.50%	-1.30%	0.70%	-0.50%	-4.30%	-0.20%	-0.2%	-7.7%
B438	Hermit Warbler	mature	mature	mature	-2.20%	-12.60%	-1.40%	0.80%	-8.20%	-2.80%	-3.80%	-9.50%	-2.50%	-4.7%	-15.1%
B460	Mcgillivray's Warbler				17.50%	4.40%	23.50%	18.60%	10.40%	22.30%	16.10%	6.90%	14.40%	14.9%	-1.3%
B463	Wilson's Warbler			all	-7.10%	-12.10%	-8.90%	-7.60%	-10.40%	-9.60%	-9.20%	-11.40%	-6.10%	-9.2%	-12.0%
B471	Western Tanager	all	mature	mature	-4.00%	-12.20%	-1.00%	0.70%	-7.60%	-2.20%	-3.60%	-8.20%	-2.00%	-4.5%	-14.8%
B475	Black-Headed Grosbeak		all	all	-5.40%	-14.60%	-5.20%	-1.90%	-10.10%	-6.00%	-5.10%	-9.70%	-4.70%	-7.0%	-15.9%
B477	Lazuli Bunting			open	12.10%	6.10%	-3.80%	-5.70%	9.70%	-5.90%	-4.00%	7.30%	3.50%	2.1%	18.3%
B482	Green-Tailed Towhee	open	open		77.20%	69.20%	50.40%	53.30%	74.40%	52.40%	57.90%	65.90%	77.30%	64.2%	82.8%
B483	Spotted Towhee			other	7.20%	-2.80%	-7.30%	-3.40%	-0.50%	-7.10%	-3.40%	-2.20%	1.70%	-2.0%	1.2%
B484	California Towhee			other	38.70%	32.30%	26.00%	25.10%	33.80%	17.90%	31.20%	31.20%	8.60%	27.2%	37.3%
B489	Chipping Sparrow	open	open	open	-11.80%	-20.00%	-23.10%	-19.00%	-17.70%	-22.80%	-18.60%	-19.50%	13.70%	-15.4%	-16.5%
B491	Brewer's Sparrow				-34.60%	-34.70%	-34.70%	-46.00%	-34.70%	-34.90%	-40.80%	-35.00%	39.90%	-28.4%	-34.6%
B493	Black-Chinned Sparrow	open			-22.90%	-20.80%	-26.50%	-36.70%	-21.00%	-26.90%	-29.40%	-22.20%	-27.90%	-26.0%	-18.4%
B494	Vesper Sparrow				-29.30%	-36.70%	-29.60%	-44.70%	-40.10%	-29.40%	-34.70%	-29.30%	-36.60%	-34.5%	-29.3%
B495	Lark Sparrow			open	6.70%	4.40%	-13.90%	-25.10%	-1.10%	-14.70%	-16.40%	-3.90%	-2.30%	-7.4%	12.3%
B497	Sage Sparrow				378.00%	391.80%	132.70%	80.80%	350.30%	154.00%	160.50%	270.50%	266.80%	242.8%	417.7%
B504	Fox Sparrow	open	open		12.30%	1.40%	-9.30%	-3.70%	0.20%	-8.10%	-3.70%	-2.30%	3.40%	-1.1%	9.7%
B505	Song Sparrow				46.10%	38.10%	12.10%	11.50%	32.00%	7.20%	18.80%	27.80%	32.90%	25.2%	58.0%
B506	Lincoln's Sparrow				492.80%	484.70%	470.30%	479.00%	488.30%	471.30%	477.50%	480.90%	421.90%	474.1%	494.3%
B510	White-Crowned Sparrow	open		other	1441.70%	1441.80%	1441.80%	1441.70%	1441.80%	1442.90%	1443.80%	1440.90%	1192.30%	1414.3%	1442.0%
B512	Dark-Eyed Junco	other	open	open	1.90%	-5.10%	-4.70%	-3.50%	-2.70%	-5.30%	-4.40%	-4.10%	0.70%	-3.0%	-2.9%
B524	Brewer's Blackbird				78.70%	70.20%	76.10%	75.20%	74.20%	74.20%	72.10%	71.80%	80.00%	74.7%	71.5%
B532	Bullock's Oriole		open mature	open mature	19.90%	10.60%	7.70%	6.10%	13.70%	0.10%	13.50%	12.10%	6.90%	10.1%	16.5%
B533	Scott's Oriole	open			-34.60%	-34.70%	-34.70%	-46.00%	-34.70%	-34.70%	-41.40%	-35.00%	-40.00%	-37.3%	-34.6%
B534	Gray-Crowned Rosy-Finch				-7.20%	-7.30%	-7.20%	-7.20%	-7.20%	-7.20%	-7.20%	-7.20%	-14.50%	-8.0%	-7.2%
B535	Pine Grosbeak	open mature			-9.10%	-10.30%	-10.10%	-9.80%	-10.90%	-10.20%	-10.20%	-10.90%	-4.60%	-9.6%	-10.7%
B536	Purple Finch	closed mature	closed mature		-0.30%	-14.50%	-0.50%	3.50%	-8.40%	-2.20%	-2.80%	-9.80%	-1.10%	-4.0%	-17.0%
B537	Cassin's Finch	mature			-4.70%	-13.40%	-12.20%	-4.50%	-11.40%	-11.40%	-8.50%	-11.20%	-3.20%	-8.9%	-13.7%
B538	House Finch			open	-9.00%	-18.40%	-23.10%	-26.80%	-16.70%	-25.20%	-24.60%	-17.20%	-12.50%	-19.3%	-9.2%
B539	Red Crossbill	mature			1.40%	-7.60%	-0.30%	5.00%	-5.40%	-0.30%	-0.90%	-4.90%	0.40%	-1.4%	-10.3%
B542	Pine Siskin	open mature		open	-1.80%	-11.90%	-10.30%	-3.20%	-9.20%	-9.70%	-6.00%	-9.70%	-2.40%	-7.1%	-12.4%

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B544	Lawrence's Goldfinch		open	open	31.50%	27.10%	22.60%	21.80%	29.50%	16.00%	27.10%	27.40%	8.30%	23.5%	29.5%	
B545	American Goldfinch				-27.40%	-27.40%	-27.40%	-30.80%	-27.40%	-27.50%	-27.40%	-30.40%	-28.90%	-28.3%	-27.4%	
B546	Evening Grosbeak	closed mature			0.60%	-11.00%	2.60%	4.30%	-6.40%	0.70%	-1.60%	-7.60%	1.00%	-1.9%	-13.5%	

4.2.3.2. Diurnal and Nocturnal Raptors (Abstracted From Keane 2000b)

I. Affected Environment

Thirty species of raptors occur in the Sierra Nevada Bioregion, of which 19 species are diurnal raptors (hawks, eagles, falcons, vultures) and 11 species are nocturnal raptors (owls)(Appendix R, Table R.3). Four species are classified in the high vulnerability group (California condor, long-eared owl, short-eared owl, and burrowing owl). These species have experienced known population declines and large range contractions. Nine species are listed in the moderate vulnerability group. Species in this group have experienced known or suspected population declines and have stable distributions or small range contractions. The remaining 17 species are classified in the low vulnerability group; these species appear to currently have stable or increasing populations and ranges. (Appendix R, Table R.3).

Raptors are of considerable conservation interest because they generally have low population densities and are top-trophic level predators that can be sensitive to chemicals that bioaccumulate through food webs. The distribution and abundance of nesting and foraging habitat are two primary limiting factors for raptor populations. The primary current threat to raptor populations is the loss, degradation, and fragmentation of habitat. Additional threats include: (1) disturbance to nest sites and breeding period and winter foraging areas from human recreation, (2) potential effects of organophosphate pesticides and other chemicals on survival and reproduction, and (3) direct mortality from shooting.

Little information exists on the historic distribution and abundance of raptors in the Sierra Nevada, and is limited primarily to general descriptions of geographic ranges and associations with major vegetation types. No information exists regarding historic population sizes for any of these species in the Sierra Nevada. Current estimates of population size (bald eagle, peregrine falcon, California condor) and estimates of the size of the known population (California spotted owl, northern goshawk) are available for species that have been of high or increasing conservation concern. No information is available on current population sizes for the other species. Population trend estimates based on monitoring of known pairs (bald eagle, peregrine falcon) and demographic parameters (California spotted owl) are available. Bald eagles and peregrine falcons have been increasing in the Sierra Nevada as populations have been recovering from pesticide-induced reductions, although overall population sizes for both species are low in the Bioregion. Demographic monitoring suggests that California spotted owl populations have been declining through the 1990s. Limited population trend information is available for the remaining species.

Three of the 30 raptor species receive no further analysis in this section. The California spotted owl and northern goshawk are emphasis species of this FEIS; these species are assessed in detail in Parts 4.4 of this chapter. The California condor was extirpated from the Sierra Nevada and was extinct in the wild, until the recent reintroduction of populations in Arizona and southern California. The California condor presently occupies portions of the Sequoia National Forest. Primary threats to California condors are direct mortality associated with chemical contaminants, lead poisoning, and shooting, and the loss of habitat and food resources to human development. Specific details related to planned recovery efforts in the Sierra Nevada are discussed in the California condor Final Recovery Plan (USFWS 1996).

To facilitate assessment of environmental consequences, the remaining 27 raptor species are grouped into five assessment groups based on similar habitat associations and/or suites of primary threats common to each group (Table 4.2.3.2a). The assessment for these species is based on a discussion of

primary threats to the species within each group and an assessment of how the alternatives are expected to affect these threats. Details of the specific assessment conducted for each group are provided in the sections below.

Table 4.2.3.2a. Distribution of diurnal raptors in the Sierra Nevada Bioregion by assessment groups.

Assessment Group	Species Included
Forest/Woodland Habitats	sharp-shinned hawk, Cooper's hawk, red-shouldered hawk, long-eared owl, flammulated owl, western screech owl, great gray owl, northern pygmy owl, northern saw-whet owl
Broad Elevational Distribution/ Habitat Generalists	red-tailed hawk, turkey vulture, American kestrel, great horned owl
Low Elevational Distributions/ Open Habitats	white-tailed kite, northern harrier, Swainson's hawk, ferruginous hawk, rough-legged hawk, merlin, short-eared owl, burrowing owl, common barn owl
Broad Elevational Distributions/ Open Habitats	Peregrine falcon, prairie falcon, golden eagle
Aquatic Habitats	bald eagle, osprey

Forest/Woodland Habitats Assessment Group

I. Affected Environment

The nine species in this group are morphologically and behaviorally adapted for living in forest and woodland habitats. Changes in forest and woodland structure and composition can affect nest site and prey availability for these species. One of the species in this group, long-eared owl, is classified as a high vulnerability group species. Seven of the species are widely distributed throughout forests and woodlands of the Sierra Nevada.

Sharp-shinned hawks, flammulated owls, northern pygmy owls, and northern saw-whet owls occur in mixed montane hardwood conifer and most conifer vegetation types, whereas Cooper's hawks, western screech owls, and long-eared owls occur in these types as well as throughout lower elevation riparian and oak woodland types. Of the two species with more restricted distributions, the red-shouldered hawk is distributed throughout riparian forests and dense oak woodlands below approximately 2,500 feet on the western slope of the Sierra Nevada, with a small number of breeding pairs occurring in the Owens Valley on the eastside of the Sierra Nevada in riparian and exotic vegetation types associated with suburban areas. The great gray owl has a restricted distribution centered on Yosemite National Park, with scattered pairs occurring on the Stanislaus, Sierra, Inyo, and Humboldt-Toiyabe National Forests. Great gray owls require a unique combination of habitats and habitat elements. They nest primarily in large diameter, broken top snags or large stick nests constructed by raptors or ravens located along the edges of meadows used for foraging. They also are known to forage in other open early seral stage habitats. Great gray owls are altitudinal migrants depending on prey and weather conditions and depend on the availability of high quality foraging habitat (meadows) throughout their range in the Sierra Nevada.

The long-eared owl is of particular concern in this assessment group because it is classified as a high vulnerability species in the Sierra Nevada bioregion. The species was historically common throughout low elevation riparian forests of California, including the Sierra Nevada. Some long-eared owl populations have disappeared, and the cause of decline is uncertain. The species is also known to occur in the conifer forests of the Sierra Nevada; however, very little is known about their

distribution and abundance. There is uncertainty about the extent to which long-eared owls use conifer forests; research is needed to fully evaluate the conservation status of this species.

Potential Risks to Forest and Woodland Raptors

It is uncertain how fuels and vegetation treatments may affect nest site habitat and prey availability for forest and woodland raptors. Exposure to chemical contamination is a potential concern. Exposure may occur through chemical use on forest lands, upslope drift from the Central Valley, and direct exposure on the wintering grounds for migratory species (for example flammulated owl and sharp-shinned hawk) and their prey (for example small migratory birds). The precise location of wintering areas for migratory Sierra Nevada raptors is unknown. Use of chemicals to reduce populations of forest pest species may also indirectly affect flammulated owls by reducing numbers of moths and other flying insects. It is uncertain how grazing in meadows may affect small mammal populations and foraging habitat quality for great gray owls. A primary threat to species that occur in low elevation oak woodlands is loss, degradation, and fragmentation of habitat due to human development. The vast majority of these oak vegetation types occur on private lands. This threat is relevant to the portion of each species' range in low elevation oak woodlands. Loss, degradation, and fragmentation of habitat are primary threats to red-shouldered hawks because they are distributed primarily in low elevation riparian and oak woodland vegetation types that are largely privately owned.

II. Environmental Consequences

A. Assumptions and Limitations

It is uncertain how the grazing strategies proposed in the alternatives affect the availability of small mammals, particularly voles and pocket gophers, in meadow systems.

B. Effects of the Alternatives on Forest/Woodland Raptors

Given that the species in this assessment group are widely distributed throughout the major conifer vegetation types modeled, changes in habitat utility scores provide a useful tool for assessing projected changes in habitat suitability across FEIS alternatives (Table 4.2.3.2b.). Eight of the nine species exhibit only small projected changes in overall habitat suitability under the FEIS alternatives. Two species exhibit small increases in habitat utility scores across all alternatives, whereas one species (western screech owl) shows small decreases in scores across all alternatives. One species (Great gray owl) exhibits a significant increase in Modified 8. Two species (Cooper's hawk, sharp-shinned hawk) exhibit small increases across all alternatives except for small projected decreases under Alternative 4 and Modified 8. Projected changes in habitat utility scores for the long-eared owl are small under all alternatives, with increases projected under Alternatives 2, 3, 5, 6, 7, and 8, and decreases projected under Alternatives 1, 4 and Modified 8. Overall, these results suggest that only small projected changes in overall habitat suitability would occur on national forest lands for these species under any of the alternatives. These changes are likely within the normal range of variation in habitat conditions for these species and suggest that these species should have a high probability of persisting in the Sierra Nevada Bioregion.

The great gray owl exhibits the largest projected changes in habitat utility scores across the alternatives. Moderate increases in habitat utility scores are projected under Alternatives 2, 3, 5, 6, and 8, whereas a moderate decrease is projected under Alternative 4. Modified 8 projects a significant increase in the habitat utility score. Smaller increases are projected under Alternatives 1 and 7. Great gray owls are projected to benefit from increases in amounts of late seral forests

generated under several of the alternatives. However, whereas late seral forests are important for providing nest sites for this species, they also require that these sites be located near meadow systems that provide foraging habitat.

The establishment of PACs surrounding great gray owl nest sites in Alternatives 5, 8, and Modified 8 should contribute to the persistence of known great gray owl sites in the Sierra Nevada. PACs protect at least 50 acres of forest nesting habitat and the entire meadow area associated with each territory. Grazing standards are likely to maintain adequate grass height to support great gray owl prey species within the meadow portions of the PACs. The extent to which surveys would occur under any of the alternatives is uncertain; if surveys are not conducted, then nest sites may remain undiscovered and unprotected in Alternatives 5 and 8, similar to the other alternatives. It is also uncertain if this strategy will be adequate for a species that is a facultative altitudinal migrant (in other words, the elevation to which great gray owls migrate varies between years, based on annual variations in weather, food, and other environmental factors) in the Sierra Nevada. It is uncertain if grazing standards and guidelines are adequate to maintain or restore meadow ecosystems within the Sierra Nevada such that they are likely to support nesting great gray owls. Therefore, whereas general increases in late-seral forests and numbers of large trees should provide increases in great gray owl nesting habitat and nest trees, it is uncertain how grazing management in foraging habitat would affect the probability of great gray owl persistence in the Sierra Nevada. This is a risk for a species with only 5 to 10 known nest territories on national forest lands and a small total population size in the Sierra Nevada (Appendix R, Table R.3).

Table 4.2.3.2b. Projected percent change in overall habitat utility for raptors in the forest and woodland assessment group, from current conditions to 50 years in the future by FEIS alternative.

Species	Alternative								
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Mod 8
Great gray owl	4.6	13.2	13.5	-9.3	9.8	11.9	6.3	11.6	25.1
Red-shouldered Hawk	4.6	3.6	4.5	5.0	6.0	5.3	5.3	6.4	2.9
Northern saw-whet owl	4.1	5.6	5.1	2.1	4.9	6.0	4.4	4.5	-0.2
Cooper's hawk	2.3	3.9	3.3	-0.8	2.4	3.8	2.2	2.3	-0.4
Northern pygmy owl	0.8	1.8	1.9	0.4	2.2	3.0	1.4	1.9	-4.7
Sharp-shinned hawk	1.0	3.0	2.3	-1.6	1.4	2.6	1.0	1.2	2.0
Flammulated owl	0.8	1.2	1.1	0.3	1.4	2.4	1.1	1.1	-1.9
Long-eared owl	-0.5	1.6	0.9	-1.9	0.4	1.4	0.2	0.1	-0.9
Western screech owl	-2.5	-2.2	-2.4	-3.1	-2.2	-1.2	-2.4	-2.8	-3.9

Broad Elevational Distribution/ Habitat Generalist Assessment Group

I. Affected Environment

The four raptor species in the broad elevational distribution and habitat generalist assessment group are widely distributed and commonly occur throughout the Sierra Nevada below elevations of approximately 10,000 feet. All of these species are abundant throughout the oak woodland vegetation types. In conifer vegetation types, they are less abundant and found in more open structural stages or in landscapes with dense forests interspersed with meadows and other openings used for foraging.

Threats

The primary threats to these species are changes in the distribution and abundance of habitat. Activities that would have the greatest effects on the species in this assessment group include: (1) forest management practices that reduce the number of openings created by stand-replacing fire events or timber harvest and (2) grazing and fire management in meadows, grasslands, and oak woodlands. Because these species are most abundant in oak woodlands along the west slope of the Sierra Nevada, changes in the amounts and distribution of these habitats would be expected to significantly affect these species. The majority of lands supporting lower elevation oak woodland types are privately owned. Hence, while management of privately owned oak woodlands along the west slope of the Sierra Nevada is important for these species, it is beyond the scope of this FEIS.

American kestrels may also be susceptible to competition with exotic European starlings for nest cavities, which could lead to declines in kestrel populations where nest sites are a limiting factor. Populations of European starlings are greatest around human development. Further human development of low elevation grasslands and blue oak woodlands has the potential to exacerbate competition for nest cavities between starlings, kestrels, and other native cavity nesting birds.

II. Environmental Consequences

Given that generalist raptors occur widely throughout the Sierra Nevada, the results from the vegetation modeling provide a meaningful assessment of projected trends in habitat suitability on national forest lands for these species. The direction of projected changes in habitat utility scores is consistent across alternatives (except Modified 8 for the Great horned owl) for each of the four species in this assessment group (Table 4.2.3.2c). American kestrels exhibit increases and red-tailed hawks and turkey vultures show decreases in habitat utility scores across all alternatives, although the projected percent changes are small in both directions. The Great horned owl exhibits increases in all alternatives except for Modified 8 where it shows a slight decrease. These results suggest that relatively minor changes in habitat suitability would occur for these species on national forest lands across all of the alternatives. The conservation status of these species in the Sierra Nevada will also be strongly affected by management of low elevation grasslands and blue oak woodlands on privately owned lands in the western Sierra Nevada (see discussion under low elevational distribution/ open habitats assessment group).

Table 4.2.3.2c. Projected percent change in overall habitat utility for raptors in the broad elevational distribution/ habitat generalists assessment group, from current conditions to 50 years in the future by FEIS alternative.

Species	Alternative								
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Mod 8
American kestrel	3.4	1.7	2.2	5.0	2.9	4.1	3.8	2.4	1.6
Great horned owl	2.0	2.6	2.5	1.6	2.6	3.7	2.3	2.2	-3.9
Red-tailed hawk	-0.5	-1.7	-1.4	-0.8	-1.2	-0.3	-1.1	-1.7	-3.7
Turkey vulture	-2.8	-3.9	-3.7	-0.8	-3.4	-3.2	-1.9	-3.7	-4.1

Low Elevational Distribution/Open Habitats Assessment Group

I. Affected Environment

The nine raptor species in the low elevational distribution/open habitats assessment group are primarily associated with open habitats, such as grasslands, shrublands, and marshes as well as low elevation blue oak woodlands on the western slope of the Sierra Nevada. As a group, grassland bird

species have exhibited the most significant population declines when compared to other species groups across western North America. This is reflected in the status of these species in the Sierra Nevada Bioregion, with two species (burrowing owl and short-eared owl) classified in the high vulnerability group and three (Swainson's hawk, ferruginous hawk, and white-tailed kite) classified in the moderate vulnerability group.

Management actions proposed in this FEIS are expected to have minimal effects on the species in this assessment group because they occur primarily in vegetation types in the Sierra Nevada that are not managed by the Forest Service. Many of these vegetation types occur primarily on privately owned lands. Additionally, the USDI Bureau of Land Management manages much of the publicly administered lands that support these vegetation types.

Threats

The primary threat to raptors in this assessment group is the continued loss, degradation, and fragmentation of habitat in grassland, shrub, and marsh vegetation types and low elevation blue oak woodlands due to human development (rural, suburban, and urban) and agricultural conversion. While not directly resulting in habitat loss, altered fire regimes, grazing, and noxious weed introductions can change vegetation structure and composition in these ecosystems. Changes in vegetation structure and composition affect the distribution, abundance, and availability of prey, especially small mammals. Pesticide contamination is a continuing threat to some of these species in both breeding areas (burrowing owl) and wintering grounds (Swainson's hawk).

II. Environmental Consequences

Given that the species in the low elevation/open habitat raptors assessment group primarily occur in vegetation types not managed to a great extent by the Forest Service, the results from the vegetation modeling analysis should be interpreted with caution (Table 4.2.3.2d). This is because the major vegetation types used by these species (for example blue oak woodlands, grasslands, shrublands, and marshes) are not adequately modeled in the vegetation analysis because few acres of these types occur on national forest lands, resulting in few plot data to model. Further, the models emphasize projected changes in conifer vegetation types, which are of marginal importance to the species in this assessment group. The future status of these species in the Sierra Nevada will be largely dictated by the management of grasslands, shrublands, marshes, and lower elevation oak woodlands that primarily occur on private and non-national forest public lands. Additionally, the types of crops produced on agricultural lands affect habitat quality for some raptor species in this group. For example, alfalfa crops support high numbers of small mammals compared to other crop types and provide important foraging habitat for Swainson's hawks, golden eagles, and prairie falcons in the northern Sierra Nevada.

Management activities proposed in the FEIS alternatives should have minimal effects on the species in this assessment group because they occur primarily on lands that are not managed by the Forest Service. However, the results do indicate that efforts to maintain and restore the structure and composition of the small amount of blue oak woodland managed by the Forest Service could contribute to the conservation of these species because of the severe threats to this vegetation type in the Sierra Nevada. Chapter 3, Part 3.3 addresses potential effects of management activities in blue oak woodlands. Efforts to reduce noxious weed distribution and abundance should positively benefit species in this assessment group. The potential negative effects of grazing on vegetation structure and composition, and subsequently on small mammal availability, are not addressed. There is

uncertainty about the effects of grazing on the functioning of these blue oak woodland, grassland, shrubland, and marsh ecosystems.

Table 4.2.3.2d. Projected percent change in overall habitat utility for raptors in the low elevational distribution/ open habitats assessment group, from current conditions to 50 years in the future by FEIS alternative.

Species	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Mod 8
Ferruginous hawk	-2.4	-2.3	-2.9	-2.8	-1.6	-0.9	-2.6	-2.5	-0.3
Rough-legged hawk	-2.4	-2.3	-2.9	-2.8	-1.6	-0.9	-2.6	-2.5	-2.4
Short-eared owl	-4.0	-13.0	-9.9	5.8	-9.1	-9.5	-5.1	-10.2	-12.1
Common barn owl	-9.4	-17.3	-15.2	2.9	-11.4	-12.9	-8.0	-11.4	185.9
Swainson's hawk	-16.2	-19.1	-16.4	-6.0	-12.8	-13.3	-10.7	-13.7	-14.7
Burrowing owl	-14.7	-24.0	-18.9	-6.0	-17.8	-23.9	-16.6	-19.8	-35.3
Merlin	-21.1	-24.6	-23.6	-19.4	-24.0	-25.0	-25.4	-25.4	-24.5
Northern harrier	-35.1	-41.9	-41.0	-18.9	-39.0	-46.4	-29.0	-39.2	83.5

Broad Elevational Distributions/Open Habitats Assessment Group

I. Affected Environment

The three species in the broad elevational distributions/open habitats assessment group are rare (peregrine falcon) to uncommon (prairie falcon and golden eagle) in the Sierra Nevada Bioregion. Peregrine falcons were nearly extirpated from California as a result of organo-chlorine pesticide contamination following World War II. Populations increased following a ban on these compounds in the early 1970s, although the number of known pairs of peregrine falcons in the Sierra Nevada is low. Prairie falcon and golden eagle populations appear stable across the Sierra Nevada, although local reductions may have resulted from loss of grassland and oak woodland habitat at lower elevations along the western slope of the range.

Threats

Exposure to pesticides is still a concern for peregrine falcons that winter in Central and South America or prey on migratory bird species that winter in these regions. Forest management activities likely have minimal or indirect effects on these species because peregrines are aerial predators that generally forage above the canopy while prairie falcons and golden eagles forage primarily in open vegetation types above and below the major conifer forest types (for example westside grasslands, open blue oak woodlands, alpine types, and eastside shrub types). Prairie falcons and golden eagles rarely forage within the conifer forest zone. The loss, degradation, and fragmentation of grasslands and open blue oak woodlands due to human development and encroachment and agricultural conversion constitute primary threats to prairie falcons and golden eagles. An additional threat to the golden eagle is the loss of large trees used for nesting. While not resulting in direct habitat loss, fire regime changes, grazing, and noxious weed introductions can change vegetation structure and composition in these ecosystems. Changes in vegetation structure and composition affect the distribution, abundance, and availability of prey, especially small mammals. An additional threat to all three species is human disturbance at cliff nest sites from recreational activities, such as rock climbing or off-highway vehicle use, which can result in territory abandonment. Falconry harvest is also a concern for prairie falcons.

II. Environmental Consequences

Effects of the Alternatives on Broad Elevation/ Open Habitat Raptors

For reasons similar to those described in detail for the low elevational distribution/ open habitats assessment group, the projected changes in habitat utility scores are of limited value for assessing effects of the FEIS alternatives on the three species in the broad elevational distribution/ open habitats group (Table 4.2.3.2e.). In addition, the vegetation projections do not model changes in alpine types and are not particularly relevant for assessing potential effects on peregrine falcon foraging. Management of grasslands, shrublands, and lower elevation oak woodlands that primarily occur on private and non-national forest public lands will largely dictate the future status of these species in the Sierra Nevada.

The management activities proposed in the FEIS alternatives should have minimal effects on peregrine falcons, prairie falcons, and golden eagles in the Sierra Nevada Bioregion. Large tree retention standards should increase the number of large diameter conifer and oak nest trees for golden eagles across all alternatives. The Forest Service manages little of the grassland and lower elevation blue oak woodlands on the western slope of the Sierra Nevada used by prairie falcons and golden eagles (see discussion under low elevational distribution/open habitats assessment group). Management activities proposed in this FEIS would not likely affect the open alpine habitats used for foraging by these species.

Table 4.2.3.2e. Projected percent change in overall habitat utility for raptors in the broad elevational distribution/ open habitats assessment group, from current conditions to 50 years in the future by FEIS alternative.

Species	Alternatives								
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Mod 8
Peregrine falcon	-1.2	-1.5	-1.6	-0.6	-1.6	-1.2	-0.6	-1.9	3.8
Prairie falcon	-3.1	-4.2	-4.1	-0.9	-3.8	-3.5	-2.0	-4.1	-2.4
Golden eagle	-3.3	-4.3	-4.2	-1.4	-3.7	-3.5	-2.2	-4.3	-1.1

Aquatic Habitats Assessment Group

I. Affected Environment

The two species in the aquatic habitats assessment group (the bald eagle and osprey) are closely associated with aquatic habitats in the Sierra Nevada Bioregion. Bald eagle is addressed in greater detail in the Part 4.3. Osprey populations experienced precipitous declines following the widespread use of organo-chlorine pesticides following World War II. Populations have increased in the Sierra Nevada Bioregion since these pesticides were banned in the early 1970s. Osprey nest along major rivers and have also benefited from the construction of artificial reservoirs along Sierra Nevada streams and rivers. The presence of reservoirs has facilitated an expansion of the osprey's range south through the Sierra Nevada. Ospreys largely migrate out of the Sierra Nevada during winter.

Threats

No information is available that suggests pesticide contamination is a significant concern to either of this species in the Sierra Nevada. Loss of large diameter conifers in the vicinity of major rivers, lakes, and reservoirs is a potential concern.

II. Environmental Consequences

Projected changes in habitat utility scores for osprey are of limited use in assessing the effects of the alternatives on these species (Table 4.2.3.2e). This species should benefit from increases in late seral forests and numbers of large trees, which should increase the availability of potential nest trees. However, management of fish populations and human recreation in rivers, lakes, and reservoirs are the key factors affecting osprey in the Sierra Nevada. These concerns are beyond the scope of this FEIS. However, given projected increases in the human population of California and demand for recreational use, concerns about the effects of human disturbance to both breeding and wintering osprey in the Sierra Nevada will increase.

Table 4.2.3.2f. Projected percent change in overall habitat utility for raptors in the aquatic habitats assessment group, from current conditions to 50 years in the future by FEIS alternative.

Species	Alternatives								
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6	Alt 7	Alt 8	Mod 8
Osprey	2.3	3.3	3.0	1.1	3.2	4.6	2.5	2.7	-1.1

4.2.4. Amphibians

While many species of wildlife use both aquatic and terrestrial environments for different life functions, the amphibians posed a special challenge with regard to determining placement in a focal ecosystem. Many species have two distinct life phases; one that is wholly aquatic followed by a second (after metamorphosis) that is semi-aquatic or primarily terrestrial. Some species of amphibians (salamanders in the family Plethodontidae) are wholly terrestrial. In this family, all life phases live on land and spend the majority of their time in moist areas under surface objects, such as dead and down wood, bark, leaf litter, and rocks. For purposes of this assessment, the amphibian species have been placed in two major groups: aquatic/riparian/meadow associates and upland/terrestrial associates. The aquatic/riparian/meadow group includes any species that have an aquatic larval life phase or any species for which current knowledge indicates that it is primarily found in association with aquatic, riparian, or meadow environments (including springs, seeps, ponds, streams, wetlands, and other aquatic habitats). This includes several members of the family Plethodontidae that are found in association with aquatic habitats, such as springs and seeps. The upland/terrestrial associates include other species from the family Plethodontidae that are known to be associated with terrestrial habitats and have no specific needs for surface water. These species can occur far from aquatic habitats though they do require moist substrates, cover objects, and subterranean refuges during hot, dry months.

Aquatic, Riparian, and Meadow Associates

Species Analyzed and Level of Analysis

Within the Sierra Nevada, there is a diverse array of amphibian species inhabiting various elevational and latitudinal zones. Fifteen aquatic, riparian, and/or meadow-associated amphibian species were identified for analysis in the FEIS due to their current legal status, or knowledge of declines in population size or distribution (FEIS Appendix R). Thirteen of these species are carried forward to FEIS (FEIS Appendix R). The two species that are dropped from analyses here are considered to be of less concern on further review of the vulnerability analysis (FEIS Appendix R). Table 4.2.4a lists all of the species along with their habitat associations and key land management issues.

Of the thirteen species analyzed in the FEIS, the greatest concern surrounds the status of frog and toad populations in foothill habitats (which are mainly private land) and in high elevation meadows and lakes. Because of these concerns, six species were identified in the Sierra Nevada Science Review (Science Review Team 1998) and then in the Notice of Intent for this FEIS: California red-legged frog (*Rana aurora draytonii*), foothill yellow-legged frog (*Rana boylei*), Cascades frog (*Rana cascadae*), mountain yellow-legged frog (*Rana muscosa*), northern leopard frog (*Rana pipiens*), and Yosemite toad (*Bufo canorus*). These species receive full individual analyses in the FEIS that includes evaluating each species' ecological needs, especially focusing on habitat associations, and identifying threats to their survival. An additional species (the Mount Lyell salamander, *Hydromantes platycephalus*) also receives a full analysis because of its status as a Federal and State Species of Special Concern.

Four of these species (California red-legged frog, foothill yellow-legged frog, mountain yellow-legged frog, and Yosemite toad) are, or historically were, widely distributed in the Sierra Nevada, the Sierra Nevada also encompasses a substantial portion of their entire geographic range (Table 4.2.4b), and there is substantial published information available on their life history and habitat needs. They receive detailed full analyses. The northern leopard frog occurs only on the eastern edge of the Sierra Nevada; its extensive range covers the north central and northeastern United States and southern

Canada. The Cascades frog reaches the southern end of its range in the northern Sierra Nevada (Lassen Peak area) (Table 4.2.4b) and occurs northward through a substantial portion of the Cascade mountains of Oregon and Washington. There is very little information available on the life history and habitat of the Mount Lyell salamander. Due to these factors, the northern leopard frog, the Cascades frog, and the Mount Lyell salamander receive cursory full analyses. Three of the remaining six species are not analyzed, as they are not known to occur on Forest Service lands. The remaining three receive limited analyses (habitat groupings) because they were not identified in the Notice of Intent and they occur on only one or two national forests in the bioregion (see Table 4.2.4a, FEIS - Appendix R, and “Factors Used to Assess Environmental Consequences” below for more details on this process).

Bioregional scale analyses of the current and historic distributions of the seven aquatic species to receive full analysis along with one salamander species complex described below in the Terrestrial Associates section were also conducted. This analysis involved the use of a Geographical Information System to overlay information about land designation, fire risk, livestock grazing, and potential protected areas on the ranges of these species. Information on the percent of a species’ current or historic range exhibiting certain conditions were then calculated and potential consequences discussed.

Of the seven species that receive full analysis in this FEIS, one of them, the California red-legged frog is Federally threatened. Five others (foothill yellow-legged frog, mountain yellow-legged frog, northern leopard frog, Cascades frog, and Yosemite toad) are Forest Service Sensitive Species. The analyses for these species appear in the T&E and Forest Service Sensitive sections of FEIS Chapter 3, respectively. The one remaining species that receives full analysis (Mt. Lyell salamander) is a Federal and State Species of Concern and it is described in the “Moderate and High Vulnerability and Other Special Status Species” section of FEIS Chapter 3. The three species that receive limited analyses are Forest Service Sensitive species and are described in that section of FEIS Chapter 3.

Assumptions and Limitations

The following are the assumptions and rationale used in conducting the amphibian effects analysis for all species:

1. The dual life histories (aquatic larvae and terrestrial adults) of most of the evaluated amphibians means they spend much of their lives at the aquatic/riparian interface. However, most of these species are closely tied to aquatic environments (usually within ¼ mile) and it was assumed they were most sensitive to changes in these environments. Therefore this analysis focused on the aquatic and immediately adjacent riparian habitats of these species.
2. Research is lacking for many cause and effect relationships between land/water management actions and amphibian population changes. Where possible, literature is cited to document these relationships. For undocumented relationships, current knowledge of amphibian life history requirements and habitat associations were used to determine potential effects of FEIS alternatives (i.e., by evaluating life requisites, such as habitat elements, it was possible to assess the potential affects of the various FEIS Standards and Guidelines on these elements).
3. For species that have declined substantially (50% or more decrease in geographic range in the Sierra Nevada), any management actions that could affect local population dynamics were considered high risk for the species as a whole.

4. Limited information is available on affects of pesticides used in California Research on the evaluated amphibian species. Thus research on herbicides, pesticides, and fertilizer impacts to related frog and toad species from outside of California was considered to be applicable to Sierra Nevada species.
5. Native predators can have significant effects on local amphibian populations. However, in the absence of other factors, it was assumed that co-evolution of predators and prey over thousands of years has resulted in dynamic, yet persistent populations of each. Therefore, native predators are not addressed as a factor in amphibian species risk analyses, unless they have been influenced in an extreme way by human actions (e.g. increase in raccoon and corvid bird predators as a result of human activities, especially campgrounds).
6. When local populations are lost or compromised through changes in habitat suitability, the larger metapopulation structure is also jeopardized. Many amphibian populations exist in metapopulation distributions because of the patchiness of their required habitats (Jennings 1996). Thus, focusing on maintenance of existing populations, restoration of declining populations, and maintaining “connections” among populations will increase the likelihood of survival and improvement of these species population status.

TERRESTRIAL ASSOCIATES

(OLD FOREST AND LOWER WESTSIDE HARDWOOD)

Species Analyzed and Level of Analysis

There are four species, and one species complex, of amphibians that fall into the category of terrestrial T.E.S. because they are listed in the California Region of the Forest Service (Region 5) as Forest Service Sensitive. In addition, three of these species are listed as California State Threatened (Table 4.2.4c). As a result of recent morphological and genetic analyses, the Pacific slender salamander (*Batrachoseps pacificus*) is here treated as a species complex called the “Relictual slender salamander complex” (Jockush et al. 1998). This complex contains four recently described species. All of these species are in the family Plethodontidae and are wholly terrestrial in the Sierra Nevada. All life stages exist on land; aquatic habitats are not required for breeding. However, these species do require moist soils to be active and are sometimes associated with seepages and springs. As with other terrestrial salamanders, these species are typically active during the rainy season and spend the dry season in subterranean refuges. When they are active on the surface, they use downed logs, rocks, and leaf litter as cover (e.g. Welsh and Lind 1991).

Four other species of salamanders were originally analyzed (DEIS) as non-T.E.S. (moderate vulnerability). Of these species, only one (the black salamander, *Aneides flavipunctatus*) remains in this category for the FEIS. It is treated in the Forest Service Sensitive species section because it requires similar habitat conditions and has similar sensitivities. However, its status is unknown; it may be extirpated in the areas where it previously occurred. The Ensatina and arboreal salamanders did not meet the revised criteria for individual analyses (see FEIS Appendix R). Table 4.2.4c lists all the terrestrial species of amphibians and provides information on their habitat associations and key land management issues. All of these species are very narrowly distributed, with most occurring on only one or two National Forests (Table 4.2.4d). Because of their narrow distributions, these species are more appropriately managed at Forest or multi-forest scales than at the bioregional scale of this

FEIS. In addition, very little is known about the details of the life histories and habitat associations of these species (Jennings 1996).

Assumptions and Limitations

1. The terrestrial salamanders are narrowly distributed in the Sierra Nevada (one or two National Forests) and it thus was not appropriate to use bioregional scale habitat models to assess consequences. Forest level management and protection are needed.
2. There is limited information on most aspects of the distribution and habitat requirements of these species of salamanders. Where possible this information was used. Where no information was available, these species are assumed to have the general characteristics of their genus or family. In some cases, research on related species from other geographic areas was used to provide context for the analysis. The lack of knowledge of actual locations of these species is a serious limitation. Without this information, understanding the real (on the ground) effects of the FEIS alternatives is difficult. Therefore most statements about effects are tempered by the phrase, “if terrestrial salamanders occur in the areas (e.g. PAC’s, Old Forest Emphasis Areas, etc) effected.” However, even if occurrence was known for specially designated areas, overall risk to a given salamander species cannot be assessed without conducting a Sierra Nevada range-wide analysis for the species that includes information on what proportion of the species localities occur within special emphasis areas.
3. Basic ecological research is needed on all of these species. Until that information is gathered, a conservative approach to management in areas of potentially suitable habitat is called for.
4. The systematic relationships of some of these species are currently under investigation. Recent work indicates the genus *Batrachoseps* (the slender salamanders) is extremely diverse in the southern Sierra Nevada (Jockusch et. al. 1998). Several of the species in this genus (including the evaluated Kern Plateau slender salamander) are currently undescribed. The uncertainty of these relationships and the potential for discovery of “new” species calls for a conservative approach to management in areas of potentially suitable habitat.
5. In general, these species are ground-dwellers, inhabiting various cover types (rocks, downed wood, leaf litter, etc). It was assumed that any activities that disturb the ground and especially affect the amount and distribution of cover are detrimental to these species.
6. Analysis of FEIS Standards and Guidelines raised concerns over lack of existing knowledge of distribution and occurrence of these salamander species. Protection measures designed for other species (e.g. aquatic frog species, spotted owl, Pacific fisher, goshawk) may benefit these salamanders if the salamanders occur in these specially designated areas (e.g. riparian areas, PAC’s, near fisher den sites, etc.).
7. For FEIS Standards and Guidelines that make generic statements about analysis of ecologically significant areas or wildlife species considerations, terrestrial salamanders will benefit if they are integrated into these analyses.

Broad Scale Trends in Amphibians

Affected Environment

Sensitivity of Amphibians to Environmental Alterations

Amphibians have several characteristics that make them somewhat more susceptible to habitat alterations and environmental contamination than other vertebrates. Most have a biphasic life cycle with aquatic larvae and semi-aquatic or terrestrial adults. Thus, they can be exposed to alterations in both of these habitats and affected during all life stages (Olson 1992). Amphibians are ectotherms, creatures whose body temperatures are not internally regulated, and are sensitive to even small changes in ambient air and water temperatures. They utilize cutaneous (through the skin) respiration extensively and must inhabit relatively moist environments to facilitate this process (Duellman and Trueb 1986). This permeability of their skin also means that they may readily absorb toxins cutaneously (see Boutilier et. al. 1992).

Amphibians typically exhibit high habitat specificity and low mobility. While some do migrate, especially to and from aquatic breeding sites, these movements are typically short distances (on the order of 100's of yards) relative to larger mammals and birds (Stebbins and Cohen 1995). The combination of low mobility and habitat specialization means that amphibian populations are often distributed in a patchy pattern on the landscape. The existence of areas of habitat that is suitable for migration is critical for both gene flow and maintenance of a viable metapopulation structure (Wiens 1996). Most amphibians are ground-dwellers and are associated with specific substrate types (e.g. rocks, downed logs) and sizes. Disturbance of soil, substrates, and ground-level vegetation can affect amphibians by changing important microhabitats qualities such as structure, moisture regimes, and temperature regimes (e.g. Welsh and Lind 1991). Lastly, amphibians inhabit a middle position in most food webs. They prey on invertebrates and are in turn preyed upon by a variety of reptiles, mammals and birds. This trophic position has several implications. For example, amphibians can potentially bio-accumulate toxins from invertebrate prey. As an important food source for many other vertebrates, changes in amphibian population dynamics can have cascading effects in an ecosystem (Pough 1980). These same characteristics make them especially vulnerable to introduced predators. Because of these characteristics and the fact that amphibians often occur in large numbers, can be relatively long-lived, and are readily sampled, they have been proposed as highly useful and cost-effective bio-indicators for ecosystem integrity (Olson 1992, Vitt 1990, Welsh and Olliver 1998).

Declines of Amphibians in the Sierra Nevada

Amphibian species, especially frogs and toads are experiencing worldwide declines, even in relatively pristine areas (Pounds et. al. 1997, Wake and Morowitz 1991). Over 50% of the 30 native Sierran amphibian species have experienced population declines and are in need of protection in order to survive. The most at-risk species are closely tied to aquatic and riparian habitats, and include the true frogs (*Rana spp.*) and toads (*Bufo spp.*). For a detailed discussion of the historic and current conditions of aquatic, riparian, and meadow environments in the Sierra Nevada see Part 3.6.

The causes of frog and toad population declines are not wholly understood and may differ depending on latitude, altitude, and species. Low elevation species, such as the foothill yellow-legged frog (*Rana boylei*) and the California red-legged frog (*Rana aurora draytonii*) have been most impacted by alteration of streams and wetland habitats as a result of grazing, mining, reservoir construction, and urbanization (Jennings 1996). Exotic predators, including numerous fish species and the bullfrog (*Rana catesbeiana*), prey on native frog/toad larvae and adults (Drost and Fellers 1996, Jennings 1996). Water and hydroelectric development may be significant factors in the decline of the foothill

yellow-legged frog (e.g., Lind et. al. 1996). Foothill yellow-legged frogs and California red-legged frogs have been extirpated from 66% and 99% of their historic ranges, respectively, in the Sierra Nevada. The northern leopard frog (*Rana pipiens*) has disappeared from almost of all of its relatively small historic range in the eastern Sierra Nevada. Grazing has been implicated as a major factor affecting the habitat of the leopard frog and the recent drought has exacerbated already tenuous conditions (Jennings and Hayes 1994).

For high elevation species, the major causal factor in the declines appears to be exotic fish, which directly prey on frog larvae and adults (Bradford et. al. 1993, Knapp 1996). Because exotic fish are well distributed in high elevation lakes and streams, they also act as barriers to dispersal and re-population by native frogs (Bradford et. al. 1993, Jennings 1996, Bradford, et. al. 1998). Introduced fish are thought to have had major impacts on the mountain yellow-legged frog (*Rana muscosa*) in the central and southern Sierra Nevada and the Cascades frog (*Rana cascadae*) in the northern Sierra Nevada (Fellers and Drost 1993, Knapp and Matthews 2000, Matthews and Knapp 1999). Habitat alteration of meadows has been implicated in the decline of the Yosemite toad (*Bufo canorus*) (Martin 1997). The mountain yellow-legged frog, Cascades frog, and Yosemite toad have disappeared from significant portions of their historic ranges in the Sierra Nevada (Jennings 1996, Jennings and Hayes 1994).

Other factors possibly affecting frog and toad populations, for which evidence is currently limited, include: disease and parasites, acid precipitation, mining, pesticides/herbicides (including estrogen-mimicking compounds), automobile emissions, ultraviolet light, and drought (Davidson et al. *In Press*, Drost and Fellers 1996, Fellers and Drost 1993, Jennings 1996, Sherman and Morton 1993). Effects of amphibian prey loss may radiate up food chains and impact other vertebrate predators, such as snakes (Jennings et. al. 1992) and birds.

Overview of National Forest Management Issues

Activities occurring on national forest lands that are of greatest concern to frogs and toads in the Sierra Nevada include: grazing, mining, fish stocking by the California Department of Fish and Game (CDFG), permitting of water diversion projects, and locally applied chemical toxins (e.g. pesticides and herbicides). While timber harvesting and prescribed burning have not been directly implicated in the declines of these species, if these activities occur in or adjacent to any type of aquatic or riparian habitat, they may have negative affects on local hydrology, fine sediment production, etc. Recreation may also be a concern, especially in riparian and aquatic habitats and it is likely to increase throughout the Sierra Nevada in the near future.

Summary of Current Bioregional Scale Conditions Relevant to Special Status Amphibians

The eight special status amphibian species/species complexes (aquatic and terrestrial combined) show differing patterns of overlap among the land designations, fire risk, grazing allotments, and potential protected areas. Three of the species (Mt.Lyell salamander, Yosemite toad, and relictual slender salamander complex) are endemic to the Sierra Nevada (i.e. 100% of their current and historic distributions are within the SNFP planning area. High percentages of several other specie's ranges in California also occur in the Sierra Nevada bioregion (mountain yellow-legged frog and northern leopard frog) (Table 4.2.4e).

Examining only the Sierra Nevada portion of these species' ranges, Forest Service lands (considering non-wilderness and wilderness) encompass 60% or more of all these species' ranges in the bioregion, indicating substantial potential effects of new management on Forest Service lands. In terms of fire

risk within the bioregion, the majority of the ranges of the high elevation species (Mt. Lyell salamander, Yosemite toad, and mountain yellow-legged frog) are categorized as low fire risk, while the majority of the ranges of the lower elevation species (California red-legged frog, foothill yellow-legged frog, and relictual slender salamander complex) are categorized as high fire risk (Table 4.2.4e). A high percent of all of the species' ranges overlap with active grazing allotments in the bioregion (Table 4.2.4e), though specific locations of species relative to locations of livestock cannot be discerned through this analysis.

Environmental Consequences

The following discussion addresses broad issues and management approaches (e.g. Aquatic Management Strategy) contained in multiple FEIS alternatives that extend beyond individual standards and guidelines. In addition, there is some discussion of issues that have received substantial attention in the FEIS (e.g. prescribed fire) but for which direct research is lacking. This may be due to either no suspected effects or simply a lack of information on the interactions among these factors and amphibian population status.

Aquatic Management Strategy

The Aquatic Management Strategy is an important aspect of this FEIS for all amphibians. The major components provide a template, which if implemented across the Sierra Nevada in a consistent manner, should result in an improvement in aquatic and riparian habitat conditions for native aquatic species. This template includes definition of Aquatic Management goals as well as specific Riparian Conservation objectives (see FEIS, Chapter 2). The primary differences across the Alternatives have to do with whether Emphasis Watersheds, Aquatic Diversity Areas and Critical Aquatic Refuges (CAR's) are designated, how Riparian areas are delineated, how Landscape/Watershed Analyses are done, and whether or not an Amphibian Reserve network is proposed (see below). Alternatives 2, 5, 6, and 8 include Emphasis Watersheds, Aquatic Diversity Areas, and/or Critical Aquatic Refuges and will potentially improve habitat conditions for amphibian species by focusing restoration in these areas. Alternative modified 8 includes Critical Aquatic Refuges only. In this Alternative, the CAR's are established to protect at risk or isolated populations as well as small watersheds that contain high quality habitats and relatively healthy populations (FEIS Appendix I). Since all Alternatives designate Riparian Areas, which will have limited vegetation management, protection for most aquatic, riparian, and meadow-associated amphibians will be increased over current management. All of the action Alternatives, except 4, include a standardized approach to Landscape/Watershed Analysis (FEIS Appendix T). A standardized approach across the Sierra Nevada is likely to provide more consistent management for species and their habitat. Since many species occur on multiple national forests this approach would reduce risk.

Amphibian Reserve Systems

Alternatives 2, 3, and 5 provide direction on the establishment of a system of reserve areas for focal amphibian species. While this approach is not yet well developed, it could be modeled after the strategy for "Important Bird Areas" and based on current knowledge of high quality areas for amphibians (e.g. Jennings 1996). In addition, a database that is currently under development will provide detailed information on locations for many amphibian species in the Sierra Nevada bioregion (Davidson, C, pers. comm.). Once this database is complete, its records are spatially referenced, and it is combined with other locality databases (e.g. California Natural Diversity Database) current techniques for reserve design (e.g. "diversity hot spots", "rarity hotspots", "complementary areas", etc. [Williams 1998]) and/or "Conservation Options and Decisions Analysis" [Bedward et. al. 1992]) could be employed.

Prescribed Fire and Wildfire

Very little research exists on the affects of either wildfire or prescribed fire on amphibians in the western United States. However, because many habitats may be in poor condition or at high risk for large fires resulting from years of fire suppression, it is important to consider the overall benefit of re-introduction of fire in the Sierra Nevada bioregion. Still some amphibian species have experienced severe declines (from a variety of factors) and a somewhat conservative approach is warranted regarding prescribed fire. The main issue for amphibians, especially those that use terrestrial habitats, is the season of burning. Both aquatic amphibians (such as frogs and toads) and terrestrial amphibians (such as Plethodontid salamanders) typically utilize riparian and upland during the wet (rainy) season. Terrestrial life stages of species often initiate surface activity in response to the 1st or 2nd rain events in the fall. Given that this is also often an optimum time for prescribed burning, consideration needs to be given to the aerial extent of burning so that large numbers of individuals or population centers are not significantly impacted. The Alternatives and associated standards and guidelines vary in their approach to this problem.

Noxious Weeds

As described in the species accounts, there is evidence that chemical applications can have both lethal and sub-lethal effects on aquatic amphibian species. These effects range from direct mortality, to deformities, to hormonal malfunctions and can occur at very low concentrations of certain chemicals. These concerns need to be reconciled with the current approaches to removal of noxious weeds. Trade-offs relative to the affect of noxious weeds on wildlife habitat need to be examined relative to the affects of herbicides on sensitive native animal species.

Potential Bioregional Scale Changes Relevant to Special Status Amphibians

Only very general conclusions can be drawn from the bioregional scale effects analyses of species' distributions relative to land designations, fire risk, and grazing allotments. Forest Service lands encompass a substantial portion of all these species's ranges in the Sierra Nevada (Table 4.2.4e) and thus new management activities occurring throughout the bioregion are likely to have far-reaching impacts. Areas that are at low-elevations with high fire risk will likely be prioritized for either mechanical fuels treatment or prescribed burning. Thus the species that occur in these zones (e.g. California red-legged frog, foothill yellow-legged frog, and relictual slender salamander complex) (Table 4.2.4e) and may be significantly affected if there is not careful consideration of the location, timing, and extent of treatments. Livestock grazing allotments occur within large portions of all these species' ranges and are an ongoing affector on both population and habitat condition. New standards that limit livestock use of wet meadows within existing allotments should reduce the amount of grazing within these species' ranges. However, change is not detectable at this bioregional scale of analysis.

For the relictual slender salamander complex, management actions targeted for other forest species may provide some risk reduction. Protected activity centers (PAC's) for the California spotted owl and northern Goshawk and detection buffers for the Pacific fisher with their differing management of forest structure (e.g. canopy closure, large tree and downed wood retention) may provide protection. This species complex demonstrated substantial overlap with proposed Pacific fisher detetion buffers and small to almost no overlap with California spotted owl and northern goshawk, respectively (Table 4.2.4e). However due to the patchy nature of suitable habitat for all these terrestrial species, these relationships need further investigation at smaller spatial scales.

Table 4.2.4a. Aquatic, riparian, and meadow associated amphibian species, criteria for inclusion on the DEIS/FEIS list, risk analysis approach, main habitat association, important habitat elements, and key management issues.

SCIENTIFIC NAME	COMMON NAME	Criteria summary	ANALYSIS APPROACH	MAIN HAB. ASSOC.	Important habitat elements	KEY MANAGEMENT ISSUES
Salamanders						
<i>Ambystoma californiense</i>	CALIF. TIGER SALAMANDER	FC,VH,SSC	not analyzed – not known to occur on FS lands	VP	grassland/oak woodland; vernal pool complexes	habitat loss/fragmentation, exotic fish predators
<i>Batrachoseps campi</i>	INYO MOUNTAINS SALAMANDER	FSSN,SSC,ENDEM	habitat associations groups	PS	riparian areas/springs in desert	narrowly distributed species; need forest level analysis; degradation of springs by humans/burros
<i>Batrachoseps spp.</i>	BRECKENRIDGE MT. SLENDER SALAMANDER	FSSN,FSC	habitat associations groups	PS	seeps with rocks or downed wood	narrowly distributed species; forest level analysis needed; changes in local hydrology
<i>Hydromantes platycephalus</i>	MOUNT LYELL SALAMANDER	FSC,SSC,ENDEM	DEIS - habitat associations groups FEIS – full analysis	PS	mixed conifer/red fir/subalpine; granite fissures	alteration of physical habitat and hydrology; rock climbing

Table 4.2.4a (continued)

SCIENTIFIC NAME	COMMON NAME	Criteria summary	ANALYSIS APPROACH	MAIN HAB. ASSOC.	Important habitat elements	KEY MANAGEMENT ISSUES
Frogs and Toads						
<i>Bufo boreas</i>	WESTERN TOAD	VM	DEIS - habitat associations groups FEIS – not analyzed	HG	most terrestrial habitats except desert; many aquatic habitats; downed wood, rodent burrows	habitat loss/alteration; pesticides
<i>Bufo canorus</i>	YOSEMITE TOAD	VH,FSSSEN,FSC,SSC,ENDEM	full analysis	PP	wet montane meadows; rodent burrows, springs	livestock grazing; exotic fish predators; chemical toxins
<i>Bufo exsul</i>	BLACK TOAD	ST,VM,ENDEM	not analyzed – not known to occur on FS lands	PP	springs/wet meadows/desert	narrowly distributed species; not on FS land; livestock grazing; changes in local hydrology
<i>Hyla regilla</i>	PACIFIC TREEFROG	VM	DEIS - habitat associations groups FEIS – not analyzed	HG	most terrestrial habitats except desert; many aquatic habitats	?
<i>Rana aurora draytonii</i>	CALIFORNIA RED-LEGGED FROG	FT,VH,SSC	full analysis	PP	ponds, wetlands, slow-moving streams; dense, shrubby riparian	habitat loss/alteration; dams/diversions; mining;; livestock grazing recreation; chemical toxins
<i>Rana boylei</i>	FOOTHILL YELLOW-LEGGED FROG	VH,FSSSEN,FSC,SSC	full analysis	PT	oak woodland/mixed conifer; streams and rivers with coarse rocky substrates and some riparian vegetation	dams/diversions; mining; livestock grazing; recreation; chemical toxins
<i>Rana cascadae</i>	CASCADES FROG	VH,FSSSEN,FSC	full analysis	PP	mountain lakes/ponds/streams/meadows; open water	exotic fish predators; fire suppression; chemical toxins
<i>Rana muscosa</i>	MOUNTAIN YELLOW-LEGGED FROG	VH,FSSSEN,FSC,SSC	full analysis	PP	montane riparian and meadow/subalpine conifer; ponds/lakes with rocky shorelines	exotic predatory fish; packstock; recreation; chemical toxins
<i>Rana pipiens</i>	NORTHERN LEOPARD FROG	VH,FSSSEN,SSC	full analysis	PP	scattered aquatic habitats in eastern Sierra Nevada; aquatic vegetation	livestock grazing; exotic predatory fish; chemical toxins
<i>Rana pretiosa</i>	SPOTTED FROG	FC,VH,FSSSEN	habitat associations groups	PP	mountainous woodlands and wet meadows; lakes and ponds	exotic predators, livestock grazing
<i>Scaphiopus hammondi</i>	WESTERN SPADEFOOT	VH,FSC,SSC	not analyzed – not known to occur on FS lands	VP	grassland/oak woodland; vernal pool complexes, burrows	habitat loss/fragmentation

Codes

MAIN HABITAT ASSOCIATION

PP – permanent ponds, lakes, wetlands
 VP – vernal pools, rain pools, snow pools
 PT – permanent/intermittent streams
 PS – permanent springs
 HG – aquatic habitat generalist
 UP – upland associate

CRITERIA SUMMARY (used for inclusion on the EIS analysis list)

ENDEM – endemic to the Sierra Nevada
 FC – Federal candidate species
 FSC – Federal special concern
 FSSSEN – Forest Service Sensitive
 FT – Federal threatened species
 SSC – State special concern
 ST – State threatened species
 VH – High vulnerability from SASI database analysis
 VM – Moderate vulnerability from SASI database analysis

Table 4.2.4b. Aquatic, riparian, and meadow associated amphibian species distributions across the 11 Sierra Nevada National Forests.

		National Forests										
Common Name	Scientific Name	Eldo	Inyo	Lass	Modo	Plum	Sequ	Sier	Stan	Taho	LTB	Toiy
Salmanders												
California tiger salamander	<i>Ambystoma californiense</i>							?	?			
Inyo Mountain salamander	<i>Batrachoseps campi</i>		X									
Breckenridge Mnt. slender salamander	<i>Batrachoseps spp.</i>						E?					
Mount Lyell salamander	<i>Hydromantes platycephalus</i>	X	X				X	X	X	X	?	X
Frogs and Toads												
western toad	<i>Bufo boreas</i>	X	X	X	X	X	X	X	X	X	X	X
yosemite toad	<i>Bufo canorus</i>	X	X					X	X		E	X
black toad	<i>Bufo exul</i>											
Pacific treefrog	<i>Hyla regilla</i>	X	X	X	X	X	X	X	X	X	X	X
California red-legged frog	<i>Rana aurora draytonii</i>	X		?		X	E	E	E	E		
foothill yellow-legged frog	<i>Rana boylei</i>	X		X		X	X	X	X	X		
Cascades frog	<i>Rana cascadae</i>			X		E?						
mountain yellow-legged frog	<i>Rana muscosa</i>	X	X	X		X	X	X	X	X	X	X
northern leopard frog	<i>Rana pipiens</i>	E	X	E	E					E	E	
spotted frog	<i>Rana pretiosa</i>				E?							
western spadefoot toad	<i>Scaphiopus hammondi</i>	?		?		?	?	?				

Codes

X = currently present

E = probably extinct, historically present

? = appears to be within the range, but not verified

Table 4.2.4c. Forest, woodland, and other habitat associated amphibian species, criteria for inclusion on the DEIS/FEIS list, risk analysis approach, main habitat association, important habitat elements, and key management issues.

SCIENTIFIC NAME	COMMON NAME	Criteria summary	ANALYSIS APPROACH	MAIN HAB. ASSOC.	Important habitat elements	KEY MANAGEMENT ISSUES
Salamanders						
<i>Aneides flavipunctatus</i>	BLACK SALAMANDER	VM	habitat associations group	UP	oak woodland/mixed conifer; talus, downed wood	narrowly distributed species; need forest level analysis
<i>Aneides lugubris</i>	ARBOREAL SALAMANDER	VM	DEIS - habitat associations group FEIS – not analyzed	UP	oak woodland/mixed conifer; mammal burrows, seepages, rock fissures	timber harvest and season of prescribed burning
<i>Batrachoseps pacificus</i> *	PACIFIC SLENDER SALAMANDER	VM, FSSSEN	DEIS - habitat associations group FEIS – see B. relictus complex	UP	oak woodland/mixed conifer; moist forest with downed wood and deep litter layer	timber harvest and season of prescribed burning important
<i>Batrachoseps relictus</i> Complex*	RELICTUAL SLENDER SALAMANDER COMPLEX	FSSSEN, FSC	habitat associations group	UP	oak woodland /mixed conifer; moist forest with downed wood and deep litter layer; rocks and bark used for cover	narrowly distributed species; forest level analysis needed; changes in local hydrology
<i>Batrachoseps simatus</i>	KERN CANYON SLENDER SALAMANDER	ST, VM, FSSSEN, ENDEM	habitat associations group	UP	oak woodland/mixed chaparral; moist forest with cover, seeps	narrowly distributed species; need forest level analysis; road construction; changes in local hydrology; timber harvest and season of prescribed burning

Table 4.2.4c (continued)

SCIENTIFIC NAME	COMMON NAME	Criteria summary	ANALYSIS APPROACH	MAIN HAB. ASSOC.	Important habitat elements	KEY MANAGEMENT ISSUES
<i>Batrachoseps stebbinsi</i> +	TEHACHAPI SLENDER SALAMANDER	ST, VM, FSEN	habitat associations group	UP	oak woodland/riparian; talus, seepages	narrowly distributed species; need forest level analysis;
<i>Batrachoseps spp.</i>	KERN PLATEAU SLENDER SALAMANDER	ENDEM	habitat associations group	UP	pinyon-juniper woodland to red-fir forest; microhabitat poorly known	habitat alterations?
<i>Ensatina eschscholtzii</i>	ENSATINA	VM	DEIS - habitat associations group FEIS – not analyzed	UP	mixed conifer; moist forest with downed wood	timber harvest and season of prescribed burning
<i>Ensatina eschscholtzii croceator</i>	YELLOW-BLOTCHED SALAMANDER	FSEN, FSC	habitat associations group	UP	oak woodlands/mixed conifer; moist forest with downed wood	narrowly distributed species; need forest level analysis; changes in local hydrology; timber harvest and season of prescribed burning
<i>Hydromantes brunus</i>	LIMESTONE SALAMANDER	ST, FSEN, ENDEM	habitat associations group	UP	mixed chaparral; limestone outcrops; rock fissures; rock and downed wood	narrowly distributed species; need forest level analysis; mining and road construction

* The species known as the Pacific slender salamander (*Batrachoseps pacificus*) has recently been split into 4 species (*B. diabolicus*, *B. kawia*, *B. regius*, and *B. relictus*) as a result of analysis of allozymes, mitochondrial DNA, and morphology and is now referred to as the “relictual slender salamander complex” (Jockush et. al. 1998).

+ The genetic relationships among populations of *B. stebbinsi* are currently being examined and it may be split into two species. This will further accentuate the narrow distribution of this species (R. Hansen, pers. comm.).

Codes

MAIN HABITAT ASSOCIATION

PP – permanent ponds, lakes, wetlands
 VP – vernal pools, rain pools, snow pools
 PT – permanent/intermittent streams
 PS – permanent springs
 HG – aquatic habitat generalist
 UP – upland associate

CRITERIA SUMMARY (used for inclusion on the EIS analysis list)

ENDEM – endemic to the Sierra Nevada
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 SSC – State special concern
 ST – State threatened species
 VH – High vulnerability from SASI database analysis
 VM – Moderate vulnerability from SASI database analysis

Table 4.2.4d. Forest, woodland, and other habitat associated amphibian species distributions across the 11 Sierra Nevada National Forests.

Common Name	Scientific Name	National Forests										
		Eldo	Inyo	Lass	Modo	Plum	Sequ	Sier	Stan	Taho	LTB	Toiy
Salmanders												
black salamander	<i>Aneides flavipunctatus</i>			E?		E?						
arboreal salamander	<i>Aneides lugubris</i>	X						X	X			
Pacific slender salamander*	<i>Batrachoseps pacificus</i>	X					X	X	X			
Relictual slender salamander complex*	<i>Batrachoseps pacificus</i>	X ^d					X ^{r,k}	X ^{e,k}	X ^d			
Kern Canyon slender salamander	<i>Batrachoseps simatus</i>						X					
Tehachapi slender salamander	<i>Batrachoseps stebbinsi</i>						?					
Kern Plateau slender salamander	<i>Batrachoseps spp.</i>		X				X					
ensatina	<i>Ensatina eschscholtzii</i>	X		X	X	X	X	X	X	X		
yellow-blotched salamander	<i>Ensatina eschscholtzii croceator</i>						X					
limestone salamander	<i>Hydromantes brunus</i>							X	X			

Codes

X = currently present

E = probably extinct, historically present

? = appears to be within the range, but not verified

* The species known as the Pacific slender salamander (*Batrachoseps pacificus*) has recently been split into 4 species (*B. diabolicus*, *B. kawia*, *B. regius*, and *B. relictus*), as a result of analysis of allozymes, mitochondrial DNA, and morphology and is now referred to as the “relictual slender salamander complex” (Jockush et. al. 1998). The National Forests on which they tentatively occur is noted using footnotes (d=diabolicus, e=regius, k=kawia, and r=relictus).

Table 4.2.4e. Percentages of historic and current distributions (range) of amphibian species at risk that occur across various land allocations.

				Land Designations ¹					Fire Risk ^{2,3}			Livestock Grazing ²	Protected FS Lands ²				
		Percent of Species' Range in California ⁴		Percent of Species' Range in the Sierra Nevada					Percent of Species' Range on Forest Service Lands in the FEIS Planning Area								
SPECIES	Range Type ⁵	SNFP EIS Planning Area	Forest Service Lands affected by the FEIS	Forest Service Lands (non-wilderness)	Wilderness (Forest Service)	Other Public Protected (e.g. NPS)	Other Public Managed (e.g. BLM)	Private	Low Fire Risk (rating = 3-4)	Moderate Fire Risk (rating = 5–6)	High Fire Risk (rating = 7-9)	Active allotments	Critical Aquatic Refuges	Important Bird Areas	Spotted Owl PAC's	Goshawk PAC's	Fisher Detection Buffers
Amphibians																	
Mt. Lyell salamander	C	100.0	62.6	25.9	37.0	31.6	0.2	5.4	71.2	18.4	1.7	46.7	not avail.	not avail.	not applic.	not applic	not applic
	H	100.0	56.0	22.0	34.1	39.2	0.2	4.5	77.0	17.1	2.0	43.5	not avail.	not avail.	not applic	not applic	not applic
Yosemite toad	C/H	100.0	67.0	19.4	47.9	31.9	0.01	0.9	69.5	14.9	2.4	44.3	not avail.	not avail.	not applic	not applic	not applic
California red-legged frog	C	0.1	0.0	31.6	0	0	0.4	68.0	0	10.1	88.1	62.2	not avail.	not avail.	not applic	not applic	not applic
	H	8.8	1.4	19.8	1.1	1.7	7.7	69.6	0	10.3	88.9	56.2	not avail.	not avail.	not applic	not applic	not applic
Cascades frog	C/H	44.1	16.3	39.9	6.0	6.7	0.8	46.5	21.4	53.1	25.1	60.5	not avail.	not avail.	not applic	not applic	not applic
Foothill yellow-legged frog	C	17.7	6.2	36.4	1.2	1.2	5.2	56.0	7.1	34.2	58.3	47.3	not avail.	not avail.	not applic	not applic	not applic
	H	21.9	8.2	37.5	2.3	2.5	7.0	50.7	7.6	33.8	58.2	56.9	not avail.	not avail.	not applic	not applic	not applic
Mountain yellow-legged frog	C	58.7	34.9	28.6	31.1	26.5	0.8	13.0	62.7	26.8	7.4	44.2	not avail.	not avail.	not applic	not applic	not applic
	H	80.8	52.4	37.6	27.4	21.3	2.3	11.3	53.9	29.2	9.5	50.1	not avail.	not avail.	not applic	not applic	not applic
Northern leopard frog	C/H	60.6	20.2	27.9	5.3	3.9	37.9	25.0	64.3	21.3	4.2	59.4	not avail.	not avail.	not applic	not applic	not applic
Relictual slender salamander species complex ⁶	C	~100.0	64.2	64.3	0	2.3	4.6	28.8	2.5	27.1	70.2	77.1	not avail.	not avail.	11.1	0.003	40.7
	H	~100.0	64.1	64.2	0	1.9	5.4	28.5	2.1	24.9	72.7	76.9	not avail.	not avail.	9.9	0.003	36.8

1 – Calculations based on data from GAP analysis (source ?). Includes all lands within the SNFP planning area, even portions of the Shasta-Trinity National Forest which are not affected by this FEIS (i.e. acreage of species' range within the land allocation of interest divided by total acreage of species' range in SNFP planning area).

2 – Calculations based on National Forest Lands affected by proposed management in the FEIS only (i.e. does not include Shasta-Trinity National Forest). Result is the acreage of species' range within the land allocation of interest divided by total acreage of species' range on Forest Service lands affected by FEIS).

3 – Fire Risk ratings are detailed in FEIS Appendix G.

4 – Calculations based on species range in California from revised CWHR maps (SASI Database, FEIS Appendix R). (i.e. acreage of species' range on SNFP or FS lands divided by total acreage of species's range in California).

5 - Range Type = Current (C), Historic (H), or Current/historic the same (C/H).

6 – Values for this species complex are approximate because due to recent systematic revisions (Jockusch et. al. 1998) revised distribution maps were not available. The Sierra Nevada portion of the distribution of *Batrachoseps pacificus* was used for these calculations since systematic revisions are largely divisions of the Sierra Nevada populations of that species

4.2.5. Fish

I. Affected Environment

Fishes of the Sierra Nevada exhibit a high degree of endemism due in part to a dynamic climatic and geological history. Many Sierra Nevada fishes have very restricted distributions, often limited to single drainage basins or in some cases to single streams or springs. In contrast, more broadly distributed species tend to fall into one of two groups: (1) species that use habitat on a large scale, primarily anadromous fishes and (2) species that require habitat that has been most altered by human activities, such as estuaries and mid-elevation streams.

Moyle and others (1996b) identified 40 kinds of fish in the Sierra Nevada Bioregion, and characterized only 17 species as having stable or expanding populations. Sixteen species were on this list based on the vulnerability analysis (Appendix R), including species from northeastern California with distributions outside the SNEP assessment boundaries, but within the planning area for this FEIS. Thus, 39 fishes of the Sierra Nevada can be characterized as having declined in population size (Table 4.2.5a). Most of these declines have occurred over the last 50 years. Sierra Nevada fish species classified by Moyle and others (1996b) as “stable or expanding” are probably best placed in the “no change” category, as continued loss of aquatic habitat characterizes the region as a whole. Any recent range expansions by native fishes are probably the result of introductions by humans, which are likely to have negative consequences for indigenous fishes and amphibians.

Table 4.2.5a. Fishes of concern within the planning area identified by Moyle and others (1996) as declining, or identified through the vulnerability assessment (Appendix R).

Species	Scientific Name	Proximity ¹	Habitats ²	Elevational Association ³	Vulnerability ⁴
Kern Brook lamprey	<i>Lampetra. hubbsi</i>		L	L, F	M
Pacific lamprey	<i>L. tridentata</i>		S, L	F, L	H
Goose Lake lamprey	<i>L. t. ssp</i>	FS	S	F	M
Chinook salmon	<i>Oncorhynchus tshawytscha</i>			L, F	
Spring run			A, L	L, F	H
Winter run			A, L	L	H
Fall run			A, L	L, F	L
Late fall run			A, L	L, F	M
Central Valley winter steelhead	<i>O. mykiss irideus</i>		A, S, L	F, H	H
Eagle Lake rainbow trout	<i>O. m. aquilarum</i>	FS	K	H	M
Kern River rainbow trout	<i>O. m. gilberti</i>	FS	S, L	H	H
Little Kern golden trout	<i>O. m. whitei</i>	FS	S, K	H	H
Volcano Creek golden trout	<i>O. m. aguabonita</i>	FS	S, L, K	F	H
Goose Lake redband trout	<i>O. m. ssp.</i>	FS	S	F	L
McCloud River redband trout	<i>O. m. ssp.</i>	NA	S	F	M
Warner Valley redband trout	<i>O. m. ssp.</i>	NA	S	F, H	M
Lahontan cutthroat trout	<i>O. clarki henshawi</i>		S, L	H	H
Paiute cutthroat trout	<i>O. c. seleniris</i>	FS	S	F	M
Goose Lake sucker	<i>Catostomus occidentalis lacusansepinus</i>	FS	S, K	F	M
Owens sucker	<i>Catostomus fumeiventris</i>		S, L, K	F, H	H
Modoc sucker	<i>C. microps</i>	FS	S	F	M
Mountain sucker	<i>C. platyrhynchus</i>		S, L	L, F, H	L
Warner sucker	<i>C. warnerensis</i>	NA	S, K	F	H
shortnose sucker	<i>Chasmistes brevirostris</i>	NA	S, L	F	M
Lost River sucker	<i>Deltistes luxatus</i>	NA	S, L	F	M
Lahontan Lake tui chub	<i>Gila bicolor pectinifer</i>		K	L, F, H	L
Cowhead Lake tui chub	<i>G. b. vaccaceps</i>	NA	S	H	M
Eagle Lake tui chub	<i>G. b. ssp.</i>	FS	K	H	M
Goose Lake tui chub	<i>G. b. thalassina</i>	FS	S	F	M
Owens tui chub	<i>G. b. snyderi</i>		S, L	F, H	H
Pit River tui chub	<i>Gila bicolor ssp.</i>		L	F	M
Sacramento hitch	<i>Lavinia exilicauda exilicauda</i>		L	F	H
Hardhead	<i>Mylopharodon conocephalus</i>		S, L	F	L
Owens speckled dace	<i>Rhinichthys osculus ssp</i>		S, K	F, H	H
Pit River roach	<i>Lavinia symmetricus mitrulus</i>		S, L	F	H
Red Hills roach	<i>L. s. ssp</i>	NA	S	F	M
San Joaquin roach	<i>L. s. ssp.</i>		S, L	L, F	H
Rough sculpin	<i>Cottus asperimus</i>	NA	S, L	F	L
Owens pupfish	<i>Cyprinodon radiosus</i>	NA	S, P	F	H
Sacramento splittail	<i>Pogonichthys macrolepidotus</i>	NA	L	L, F	H

¹Proximity: FS = distributed primarily within or adjacent to Forest Service boundaries; NA = found outside areas of direct influence; if no class is identified, species are affected to varying degrees depending on distribution of individual populations.

²Principal habitats: A = anadromous, S = small stream, L = large stream, K = lakes and reservoirs, P = springs.

³Elevational Association: L = lowlands, F = foothills, H = high elevations

⁴Vulnerability: L = low, M = moderate, H = high.

Risk Factors

Moyle and others (1996b) offered five categories of causes for the decline of native fishes in the Sierra Nevada: introduced species, dams and diversions, alteration of aquatic habitats, watershed disturbance, and other (for example, exploitation and pollution). Their analysis, which assigned scores from 0 to 4 (“no known effect” to “factor was of major importance”) to each category by species, did not suggest that any single category has been dominant in causing the decline of fishes in the Sierra Nevada region. The relationships among these categories should also be noted; the first four categories all appear important on national forest lands.

Dams have probably been the major factor resulting in population declines for fish species that were once broadly distributed and those that use habitat on a large scale (mainly anadromous fishes). Dams and diversions affect once broadly distributed foothill fish species of the Sacramento - San Joaquin River system in at least three ways: (1) dams and diversions directly result in habitat loss and habitat alteration; (2) dams and diversions can provide habitat for introduced species that negatively affect native taxa; and (3) dams and diversions fragment populations above impassable barriers. Both the Sacramento hitch and the hardhead fall into this category. Dams and diversions threaten anadromous species because large proportions of their original ranges are either lost or no longer accessible. This factor also increases the importance of conditions in drainages that remain accessible to anadromous species.

Moyle and others (1996b) most often cited introduced species as a factor of major importance in the decline of Sierra fishes. For trout with restricted distributions (for example, the Kern River rainbow trout, Little Kern golden trout, California (or Volcano Creek) golden trout, and Lahontan cutthroat trout), hybridization, competition, and predation by non-native trout are key factors in major declines from historical abundances. Introduced species also apparently threaten hardheads, several subspecies of Tui chub, and the Owens pupfish. Unfortunately, eradication of well-established non-indigenous fishes from streams and rivers has rarely been achieved, and certainly never without negative effects on native taxa. This fact increases the importance of maintaining existing populations of native species that do not share their environments with introduced species. In these instances, other factors affecting isolated populations, such as watershed disturbance and change in aquatic habitat, may assume greater importance to the taxon as a whole.

Moyle and others (1996b) most frequently cited change in aquatic habitat as a factor of moderate importance in declines of Sierra Nevada fishes. (Two notable exceptions are the Owens speckled dace and the Owens pupfish.) While road building, channelization, and riparian grazing appear unlikely to individually threaten the population viability of many species, these activities clearly alter habitat and may contribute to significant cumulative effects on fishes. Similarly, watershed disturbance in general, including logging, grazing, mining, and urbanization, was rarely cited as a factor of major importance in the decline of Sierra Nevada fishes (Moyle and others 1996a). Extreme watershed disturbance, however, may influence the viability of taxa with limited distributions (for example Eagle Lake rainbow trout).

Influence of Forest Service Activities

Effects of Forest Service activities on fishes vary considerably, depending on the species’ distribution and life history patterns. Species most likely to be affected are those that are either narrowly distributed within the national forest boundaries or inhabit small springs, lakes, or streams. Generally, as one moves downslope and the size of the stream or river increases, direct Forest Service influence on aquatic habitat conditions diminishes as other factors play increasing roles. Based on the

overlap of their distribution and national forest boundaries, about one-third of the Sierra fishes suffering significant declines from historic abundances are confined to, or are overwhelmingly influenced by activities on, national forest lands (effects class FS in Table 4.2.5a). Nine of the species are sufficiently distributed outside national forest boundaries such that little measurable impact from Forest Service activities would be expected (effects class NA in Table 4.2.5a). The remaining species are distributed such that Forest Service activities would have varying levels of influence, depending on the specific location of each population. A broad range of factors affect anadromous fishes, including estuary and ocean conditions and exploitation.

II. Environmental Consequences

A. Assumptions and Limitations

Key uncertainties

There are several uncertainties that can potentially affect the outcomes of these alternatives. Foremost is the uncertainty surrounding the effectiveness of riparian area protection standards in combination with the levels of planned activities, and whether these will promote recovery of aquatic systems and associated species. While the direction provided herein has been developed based on sound ecological reasoning and follows management direction established in the Pacific Northwest, it remains an untested hypothesis in the Sierra Nevada.

The second major uncertainty pertains to the consequences of landscape analysis. Potential benefits for fish under Alternatives 2, 5, 6, 8 and Modified 8 depend greatly on the consequences of landscape analyses. These alternatives identify special management areas (such as critical refuges, emphasis watersheds, and aquatic diversity areas) that influence habitat for all or almost all declining species on national forest lands, and these alternatives require landscape analyses within these areas to varying extents. Fish species would benefit from landscape analyses, which would identify restoration opportunities, adjust management based on accurate assessment of risks, and identify detrimental management activities, only to the extent that these analyses subsequently guide management activities. Management is expected to respond to landscape analysis in ways that benefit fishes, but this cannot be assured. Uncertainty is slightly reduced under Alternative 5, which specifically requires that landscape analysis identify management actions that should not occur. Direction in Alternative 8 for landscape analyses to specifically address the aquatic management strategy (AMS) goals might also lead to actions more likely to benefit fish.

B. Effects of the Alternatives on Fishes

Management Areas. Alternatives 2, 5, 6, 8 and Modified 8 identify special management areas, selected in part based on consideration of fish habitats. Critical aquatic refuges are included in Alternatives 2, 6, 8, and Modified 8; critical refuges are included in Alternative 5. Alternatives 2, 6 and 8 also delineate emphasis watersheds. Modified Alternative 8 has expanded critical aquatic refuges, much larger than those in the other alternatives. Alternative 5 delineates aquatic diversity areas, which generally overlap with emphasis watersheds, but encompass larger areas. These special areas are potentially significant to the viability of native fishes: 22 of the 36 fishes in the Sierra Nevada group with declining numbers can be found in these special management areas, including all that occur on national forest lands. Management in these areas could directly affect the entire current range of 11 fish species. Three additional declining species occur downstream of special management areas, and thus might benefit from planning and management activities in these areas.

Direction for planning and conducting management activities in special management areas varies between alternatives. Alternatives 2, 5, 6, 8, and Modified 8 state that critical aquatic refuges should be priority area for landscape analysis as well as a high priority for watershed restoration activities. Management activities within CARs should be compatible with the goal of sustaining and enhancing habitat for aquatic and, or riparian dependent species. Alternative 5 further emphasizes landscape analyses by requiring that they be completed before activities requiring documentation in an environmental assessment or environmental impact statement are conducted. Alternative 8 emphasizes landscape analyses by requiring them in emphasis watersheds before projects requiring a Decision Notice or a Record of Decision are conducted. Other alternatives emphasize landscape analyses to lesser extents than Alternatives 5 and 8, and require them in situations not specifically targeted to benefit fish.

In Alternative 5, special management areas (critical refuges and aquatic diversity areas) influence planning and management in the form of landscape analyses. Specifically, timber harvest and fuels treatments would be prohibited in these areas unless such activities contributed to the attainment of Aquatic Management Strategy (AMS) goals. Pesticide use would be prohibited in special management areas under Alternative 5. These provisions would benefit fish where watershed disturbance or pollution were significant determinants of abundance.

The incorporation of AMS goals in the planning and implementation of management activities should influence management impacts on the population viability of fishes. The AMS goals affect all of the action alternatives (Alternatives 2 through Modified 8) in that mining and pesticide use in riparian areas “must be compatible with the goals of the AMS.” However, in contrast to the other alternatives, Alternative 5 uses the AMS goals as the basis for several standards and guidelines.

Riparian Areas. Linkages between riparian and instream processes and habitat indicate that differences between alternatives, in terms of their effect on fishes, are influenced by the extent of: (1) designated riparian areas and (2) the activities allowed in these areas. Determining how different approaches to delineating riparian areas might affect fishes is complicated by several factors. The variable width approach (used in Alternatives 2, 4, and 5) includes two classes of riparian areas (green and grey zones), with some standards and guidelines applying only to green zones. Both the variable width approach (Alternatives 2, 4, and 5) and Alternative 3 would use site-specific analyses to delineate riparian zones, but the specific outcomes of these analyses are uncertain. While the stream type, flexible width approach to identifying riparian areas (Alternatives 6, 7, 8, and Modified 8) would probably result in larger riparian areas along perennial streams than the variable width approach, the latter might be more effective in reducing cumulative watershed effects.

The alternatives provide a range of riparian area protection guidance. Alternative 5 is the most restrictive. Alternative 5 prohibits all land disturbing activities in green and grey zones unless they benefit riparian-dependent or aquatic species, or water quality, and the benefits are demonstrated via landscape analysis. Most of the other alternatives prohibit salvage or commercial logging in green zones (Alternative 2) or stream type riparian zones along permanent and intermittent streams (Alternative 8). Timber harvesting may be conducted in riparian areas, following different guidelines, under Alternatives 3, 4, 6, 7, and Modified 8. Alternatives 3 and 5 prohibit road building in riparian zones; Alternative 5 further addresses negative effects of roads on streams by requiring that failed road crossings and culverts be identified and have priority for rehabilitation.

Summary of Effects on Fishes

Alternative 5 would likely yield better conditions for fishes than the other alternatives. Watershed disturbance and direct habitat alterations would likely be lowest under this alternative.

Like Alternative 5, Alternatives 2, 6, 8, and Modified 8 recognize special management areas (critical aquatic refuges and emphasis watersheds). Delineation of these areas is based in part on the distribution of declining Sierra fishes. This element renders these alternatives superior to Alternatives 1, 3, 4, and 7 provided that landscape analyses in special management areas result in lower levels of watershed disturbance and alteration of aquatic habitats.

Alternatives 3, 4, and 7 lack the strategic direction provided in other alternatives. For example, these alternatives (along with Alternatives 2, 5, 6, 8, and Modified 8) include direction for assessing cumulative watershed effects at the project level and general reference to broad goals, such as watershed restoration. While riparian area protection at the individual project level seems adequate to minimize direct impacts from upslope activities, clear direction as to where watershed restoration should be emphasized and how landscape analysis would be used to promote the AMS goals is not readily apparent in these alternatives.

Contribution of Alternatives to Future Status

In the absence of additional threats in the form of dams and diversions and introduced species, Alternative 5 would have a high probability of creating and sustaining the habitats necessary to enhance populations of all declining Sierra fishes found only on national forest lands, and most fishes affected by threats both on and off national forest lands.

Because delineation of special management areas in Alternatives 2, 6, 8, and Modified 8 these alternatives are accompanied by specific management guidelines; however, the influence of these special management areas on the sustainability of Sierra Nevada fishes is uncertain. Most population declines of Sierra Nevada fishes are relatively recent, suggesting the inadequacy of current management approaches (Alternative 1). Alternatives 3, 4, and 7 do not readily suggest sufficient improvement over current management to confidently reverse declining trends in Sierra Nevada fishes found only on national forest lands.

Of the Sierra Nevada fishes, the future status of anadromous species would be least affected by proposed Forest Service management under all alternatives in this FEIS.

4.2.6. Reptiles (Abstracted from Staub 2000)

Broad Scale Trends in Reptiles

Bioregional scale analyses of the current and historic distributions of at-risk reptiles (western pond turtle, blunt-nosed leopard lizard, coast horned lizard, Sierra night lizard, Panamint alligator lizard, and California legless lizard) were conducted. This analysis involved the use of a Geographical Information System to overlay information about land designation, fire risk, livestock grazing, and potential protected areas on the ranges of these species. Information on the percent of a species' current or historic range exhibiting certain conditions were then calculated and potential consequences discussed.

Affected Environment

Summary of Current Bioregional Scale Conditions Relevant to Special Status Reptiles

The six species of reptiles show differing patterns of overlap among the land designations, fire risk, grazing allotments, and potential protected areas. Except for the Sierra night lizard and the Panamint alligator lizard, the Sierra Nevada bioregion makes up only a small portion of the ranges of these reptiles in California (Table 4.2.6a). However, within the Sierra Nevada portion of these species' ranges, Forest Service lands (considering non-wilderness and wilderness) encompass at least one third of most of the species' distribution. Because of their strong desert, valley, and foothill associations, most of these species occur primarily in the moderate to high fire risk areas of the lower elevation western slope of the Sierra Nevada (Table 4.2.6a). The Panamint alligator lizard is again an exception occurring in areas of relatively low fire risk in the Inyo Mountains. A high percent (most, greater than 50 percent) of all of the species' Sierra Nevada distributions overlap with active grazing allotments in the bioregion (Table 4.2.6a) though specific locations of species relative to locations of livestock cannot be discerned through this analysis.

Environmental Consequences

Potential Bioregional Scale Changes Relevant to Special Status Amphibians

Only very general conclusions can be drawn from the bioregional scale effects analyses of species' distributions relative to land designations, fire risk, and grazing allotments. Forest Service lands encompass a moderate portion of all these species' ranges in the Sierra Nevada (Table 4.2.6a) so new management activities occurring throughout the bioregion may have significant impacts. Areas that are at low-elevations with high fire risk will likely be prioritized for either mechanical fuels treatment or prescribed burning. Thus the species that occur in these zones (western pond turtle, coast horned lizard, and California legless lizard) (Table 4.2.6a) may be affected unless careful consideration is given to of the location, timing, and extent of treatments. Livestock grazing allotments occur within substantial portions of all these species' ranges and are an ongoing affector on both population and habitat condition.

Table 4.2.6a. Percentages of historic and current distributions (range) of reptile species at risk that occur across various land allocations.

				Land Designations ¹					Fire Risk ²			Livestock Grazing ²	Protected FS Lands ²	
		Percent of Species' Range in California ³		Percent of Species' Range in the Sierra Nevada					Percent of Species' Range on Forest Service Lands in the FEIS Planning Area					
SPECIES	Range Type ⁴	SNFP EIS Planning Area	Forest Service Lands affected by the FEIS	Forest Service Lands (non-wilderness)	Wilderness (Forest Service)	Other Public Protected (e.g. NPS)	Other Public Managed (e.g. BLM)	Private	Low Fire Risk (rating = 3-4)	Moderate Fire Risk (rating = 5-6)	High Fire Risk (rating = 7-9)	Active allotments	Critical Aquatic Refuges	Important Bird Areas
Reptiles														
Western pond turtle	C/H	15.1	4.7	34.7	3.6	4.1	6.9	50.6	10.5	36.2	52.9	62.5	not avail.	not avail.
Blunt-nosed leopard lizard	C	0.6	0.2	23.1	0	0	0.9	75.8	0	87.7	8.7	79.0	not avail.	not avail.
	H	4.2	0.2	5.9	0	3.1	2.0	88.9	0	85.7	7.7	41.4	not avail.	not avail.
Coast horned lizard	C	10.6	1.2	11.3	0	1.2	11.7	75.7	0	18.9	79.5	77.9	not avail.	not avail.
	H	13.4	1.9	10.7	3.6	0.9	23.5	61.2	17.6	26.8	52.4	81.8	not avail.	not avail.
Sierra night lizard	C/H	~100.0	~100.0	not avail	not avail	not avail	not avail	not avail	not avail	not avail	not avail	not avail	not avail.	not avail.
Panamint alligator lizard	C/H	62.4	36.0	37.4	20.1	11.5	30.8	0.2	94.2	5.7	0	23.5	not avail.	not avail.
California legless lizard	C	4.1	0.9	22.6	0.01	10.8	13.2	53.3	0.1	11.3	87.9	83.1	not avail.	not avail.
	H	6.3	2.0	29.2	2.1	6.8	21.7	43.0	0.1	17.5	81.4	78.3	not avail.	not avail.

1 – Calculations based on data from GAP analysis. Includes all lands within the SNFP planning area, even portions of the Shasta-Trinity National Forest which are not affected by this FEIS (i.e. acreage of species' range within the land allocation of interest divided by total acreage of species' range in SNFP planning area).

2 – Calculations based on National Forest Lands affected by proposed management in the FEIS only (i.e. does not include Shasta-Trinity National Forest). Result is the acreage of species' range within the land allocation of interest divided by total acreage of species' range on Forest Service lands affected by FEIS).

3 – Fire Risk ratings are detailed in FEIS Appendix G.

4 – Calculations based on species range in California from revised CWHR maps (SASI Database, Appendix R). (i.e. acreage of species' range on SNFP or FS lands divided by total acreage of species's range in California).

5 - Range Type = Current (C), Historic (H), or Current/historic the same (C/H).

6 – Values for this species complex are approximate because due to recent systematic revisions (Jockusch et. al. 1998) revised distribution maps were not available. The Sierra Nevada portion of the distribution of *Batrachoseps pacificus* was used for these calculations since systematic revisions are largely divisions of the Sierra Nevada populations of that species.