United States Department of Agriculture

Terrestrial Wildlife
Biological Assessment, Evaluation and Wildlife Report
Rim Fire Reforestation

Stanislaus National Forest
Pacific Southwest Region
USDA Forest Service
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Date

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1. INTRODUCTION

The purpose of this document is to evaluate and disclose the effects of the Stanislaus National Forest (STF) Rim Fire Reforestation project to Threatened, Endangered, and Sensitive wildlife species; pursuant to the Endangered Species Act (ESA) of 1973, the National Forest Management Act (1976), Forest Service Departmental Regulation 9500-004, the Stanislaus National Forest Land Management Plan (USDA 1991), as amended by the Sierra Nevada Forest Plan Amendment (SNFPA) Final Supplemental Environmental Impact Statement (FSEIS) (USDA 2004). The STF "Forest Plan Direction" presents the current Forest Plan management direction, based on the original Forest Plan as modified through the Forest Plan appeals and amendment processes (USDA 2010). The content of this BA and BE conforms to legal requirements set forth under Section 7, 19 U.S.C. 1536C, and 50 CFR 402.12.

Threatened & Endangered species are those Federally listed by the USFWS; Candidate species are candidates to become Proposed species but issuance of a proposed rule is currently precluded by higher priority listing actions (USFWS 1998). Sensitive species are those designated by the Regional Forester with the goal of proactively developing and implementing management practices to ensure that those species do not become Threatened or Endangered, and therefore require protection under the Endangered Species Act because of Forest Service actions (Departmental Regulation 9500-004).

Other species of particular conservation concern were also identified during the planning process for this project, mule deer and black-backed woodpeckers, and they are also analyzed in this document.

Table 3.16-1 Endangered, Threatened (T), Candidate (C), Sensitive species (S), and other species of conservation concern considered in this analysis. Some species may also be identified as Management Indicator Species (MIS) -- see the Rim Fire Reforestation MIS Report for additional details and analysis of species identified as MIS here.

Common Name[1]	Scientific Name	Status	Addressed in detail in this BA/BE
Threatened & Endangered			
Valley Elderberry Longhorn Beetle	*Desmocerus californicus dimorphus*	T	yes
Sensitive			
Birds			
Bald Eagle	*Haliaeetus leucocephalus*	S	yes
California Spotted Owl	*Strix occidentalis occidentalis*	S, MIS	yes
Great Gray Owl	*Strix nebulosa*	S	yes
Northern Goshawk	*Accipiter gentilis*	S	yes
Willow Flycatcher	*Empidonax traillii*	S	no
Mammals			
Pacific Marten	*Martes caurina*	S, MIS	yes
Fisher	*Pekania pennanti (formerly Martes pennanti pacifica)*	S	yes
California Wolverine	*Gulo gulo luteus*	S	no
Sierra Nevada Red Fox	*Vulpes vulpes necator*	S	no
Fringed Myotis	*Myotis thysanodes*	S	yes
Pallid Bat	*Antrozous pallidus*	S	yes

Common Name[1]	Scientific Name	Status	Addressed in detail in this BA/BE
Townsend's Big-Eared Bat	*Corynorhinus townsendii*	S	yes
Invertebrates			
Western Bumble Bee	*Bombus occidentalis*	S	Yes
Other species of conservation concern			
Other Species of particular conservation concern for this project			
Black-Backed Woodpecker	*Picoides arcticus*	MIS, SCC	*yes*
Mule Deer	*Odocoileus hemionus*	MIS, SCC	*yes*

[1] Numbering tables in this report are intended to mimic the found in the EIS so the reader can easily reference between documents.

Species are considered in detail where occupancy has been confirmed or where suitable habitat occurs in close proximity to the project and effects are expected. Refer to the Sierra Nevada Forest Plan Amendment (USDA 2001 and 2004), hereby incorporated by reference, for additional information on species considered in this document.

The Rim Fire Reforestation project action area is either outside the geographic range or elevation range or doesn't provide habitat for; willow flycatcher, California wolverine, Sierra Nevada red fox, and Townsend's big-eared bat. Therefore, they will not be considered further in this BA/BE. The following briefly discusses our rationale for not considering these species further:

Willow Flycatcher (*Empidonax trailii*)

The action area is within the historic geographic range of willow flycatcher but this species is most likely extirpated from this area (Siegel et al. 2008a). Although willow flycatcher (Empidonax traillii) have been historically documented near portions of the project area, including the Ackerson Meadow complex, the Rim Fire Reforestation project footprint does not contain areas with suitably dense willows or wet meadows. Project areas are not expected to result in any disturbance to nesting or foraging willow flycatchers if they occur in the larger Rim Fire area because project areas are not sufficiently proximal to potential habitat. Thus, this species is not addressed in further detail in this document.

California Wolverine (*Gulo gulo*)

The action area is within the historic geographic range of wolverine (USDA 2001, 2004), but suitable habitat is not present sufficient to meet habitat capability needs for this species. The wolverine is dependent on non-forest alpine habitats associated with permanent snowfields; a critical habitat element is low human disturbance potential (USDA 2001; McKelvey et al. 2008). This habitat type and element are not present in the action area (Baumbach, pers. obs.). The much publicized occurrence of a wolverine near Lake Tahoe was determined to not be ssp. *luteus* and was most likely a widely dispersing individual from the Sawtooth Range (Moriarty et al. 2009). Thus, this species is not addressed in further detail in this document.

Sierra Nevada Red Fox (*Vulpes vulpes necator*)

The action area is within the species' historic range (USDA 2001, 2004) but suitable habitat is not present sufficient to meet habitat capability needs. Suitable habitat consists of subalpine zone forests and alpine fell fields at high elevations (USDA 2001, Perrine et al. 2010, and Statham et al. 2012). Such habitat is not present in the action area (Baumbach, pers.obs.). Thus, this species is not addressed in further detail in this document.

2. CONSULTATION TO DATE

An official list of Threatened, Endangered, and Proposed species that could occur in or be affected by the Rim Fire Reforestation project was obtained from the Sacramento FWS website on June 26, 2015 (Project Record). This list identified all species that could be affected by activities in the Cherry Lake South, Ascension Mountain, Duckwall Mountain, Tuolumne, Jawbone Ridge, Cherry Lake North and Hull Creek 7½ minute quadrangle maps, and was used as a basis for determining which species should be considered in this document.

REGIONAL FORESTER SENSITIVE SPECIES

Departmental Regulation 9500-004 Direction to Department Agencies

1. Assure that the values of fish and wildlife are recognized, and that their habitats, both terrestrial and aquatic, including wetlands, are recognized and enhanced where possible as the Department carries out its overall missions.
2. Consider fish and wildlife and their habitats in developing programs for these lands. Alternatives that maintain or enhance fish and wildlife habitat should be promoted. When compatible with objectives for the area, management alternatives that improve habitat will be selected.
3. Balance the competing uses for habitat supporting fish and wildlife through strong, clear policies, relevant programs, and effective actions to sustain and enhance fish and wildlife in desired locations and numbers.
4. Recognize that fish and wildlife have inherent values as components and indicators of healthy ecosystems, and that they often demonstrate how altered environments may affect changes in quality of life for humans.
5. Avoid actions "which may cause a species to become threatened or endangered".

Departmental Regulation 9500-004 Direction to Department Agencies

1. Conduct activities and programs "to assist in the identification and recovery of threatened and endangered plant and animal species."
2. Avoid actions "which may cause a species to become threatened or endangered."
3. Consult "as necessary with the Departments of the Interior and/or Commerce on activities that may affect threatened and endangered species."
4. Not "approve, fund or take any action that is likely to jeopardize the continued existence of threatened and endangered species or destroy any habitat necessary for their conservation unless exemption is granted pursuant to subsection 7(h) of the Endangered Species Act of 1973, as amended."

3. PROJECT DESCRIPTION

Following is a description of the alternatives analyzed in detail in this document. Refer to the Rim Fire Reforestation EIS for in depth discussion on the alternatives, including those not analyzed in detail. Management requirements specific to each alternative are listed following the alternative description and management requirements common to all alternatives are listed at the end of this section.

ALTERNATIVE 1 (PROPOSED ACTION)

This is the Proposed Action, as described in the Notice of Intent (80 Federal Register 39, February 27, 2015; p. 10663-10664), with corrections based on additional field surveys (i.e. new noxious weed populations discovered) and mapping refinement (Chapter 1.04). Alternative 1 includes the treatments and actions described below.

- Enhance deer habitat through conifer planting on 646 acres within the 3,833 deer acres. An additional 33 acres will be monitored for Natural Regeneration within the Deer Enhancement habitat.
- Alternative 1 includes natural regeneration on up to 4,031 acres. Reduce fuels if the amount exceeds the maximum (10 or 20 tons per acre) amount within the specific units. Monitor species and number of trees across the landscape to decide if site prep, planting, release and burning would occur.
- Alternative 1 includes noxious weed eradication on up to 5,714acres. The majority of the noxious weed treatments are within the reforestation units.
- Alternative 1 includes site preparation and planting conifers on up to 21,300 acres. Base composition and density on landscape position, Strategic Fire Management Areas (SFMA) and elevation.
- Alternative 1 includes hand grubbing or manually applying herbicides (glyphosate) on up to 21,300 acres.
- Alternative 1 includes prescribed fire in new plantations on up to 21,300 acres.
- Alternative 1 includes prescribed understory burning and thinning within existing plantations (outside of Deer Enhancement areas) on up to 12,769 acres.

Management Requirements (Terrestrial Wildlife) Specific to Alternative 1

1. Flag and avoid elderberry plants greater than one inch stem diameter in unit Z030. Prohibit herbicide application within 100 feet of elderberry shrubs.

ALTERNATIVE 2 (NO ACTION)

Alternative 2 (No Action) provides a baseline for comparison with the other alternatives (EIS, Table 2.05-1). Under Alternative 2 (No Action), deer habitat enhancement, noxious weed eradication, reforestation (site preparation, planting conifers, release and reintroduction of prescribed fire) and thinning would not occur. Current management plans would continue to guide management of the project area. Deer habitat plantings for thermal cover would not be accomplished, delaying the establishment of this important habitat component. Noxious weeds would persist and continue to spread within and adjacent to the Rim Fire reforestation units. None of the standing biomass and woody fuels would be removed from the thinning units leaving tens to hundreds of tons of fuel per acre in these overstocked stands, greatly hindering firefighting and future fire control. Only natural regeneration would return forests to this landscape, taking hundreds of years to reach maturity in some areas, especially where mature green conifers are non-existent. Existing older plantations would not be thinned, leaving them overly dense with overlapping crowns and without the desired ICO structure.

Management Requirements Specific to Alternative 2

No management requirements associated with this alternative.

ALTERNATIVE 3

Alternative 3 responds to the significant issues and concerns identified through public scoping (EIS, Chapter 1.08). Compared to Alternative 1, it addresses those issues by proposing: additional human and native species health protections (no herbicides) and a different fuel break ridge treatment responding to the reforestation issue of fire hazard.

- Alternative 3 includes similar deer habitat enhancement treatments as Alternative 1 within the same 3,833 unit acres; however, site prep 646 acres of tilling and hand grub release to replace herbicide use on the 646 planted acres.
- Alternative 3 includes the same natural regeneration units as Alternative 1 on 4,031 acres that could potentially be planted. Treatments would be similar to Alternative 1, except mechanical site prep and hand grubbing for release would replace herbicide use.
- Alternative 3 proposes noxious weed eradication on approximately a third of the acres as Alternative 1. Only those populations and species that can be effectively eliminated through non-chemical means are proposed for treatments on 3,131 acres. Methods for removal include: burning, targeted grazing, grubbing, hand-pulling, and native seeding. The majority of the noxious weed treatments are within the reforestation units.
- Alternative includes site preparation and planting conifers on 21,300 acres using a variable planting design. Because no herbicides are proposed under this alternative, site prep and planting design is modified from Alternative 1. However, long-term desired conditions are the same as Alternative l.
- Release would be accomplished by manually grubbing vegetation on 21,300 acres.
- Alternative 3 includes similar burning through new plantations post-planting as Alternative 1 on the same 21,300 acres.
- Alternative 3 includes similar understory burning and thinning on 12,769 acres in existing plantations as Alternative 1.

Management Requirements Specific to Alternative 3

No terrestrial wildlife Management Requirements specific to Alternative 3, see Management Requirements Common to all Alternatives.

ALTERNATIVE 4

Alternative 4 responds to the significant issues and concerns identified through public scoping (Chapter 1.08). Compared to Alternative 1, it addresses those issues by proposing: considerably fewer planted acres and trees and the reintroduction of early and frequent use of prescribed and natural fire within and adjacent to these stands. Thousands of acres, proposed in Alternative 1, would not have initial mechanical fuels treatments and would remain unplanted in Alternative 4. Reforestation would occur on 2,867 acres. In addition, complex early seral forest is left intact and removed from reforestation consideration.

- The area of deer habitat enhancement (3,833 acres) in Alternative 4 has the same acres of prescribed burning and ICO thinning as Alternative 1 (1,164 acres). This alternative also includes 88 acres of planting, 558 acres fewer than Alternative 1.
- Alternative 4 does not include natural regeneration treatments as described in Alternative 1. The heading “Plant Conifers” (EIS, Chapter 2) describes how natural regeneration is treated in Alternative 4.
- Alternative 4 includes similar noxious weed eradication as Alternative 3 on 3,131 acres. No herbicides would be used.

- Alternative 4 would reforest no more than 20% of each unit proposed in Alternative 1, 2,867 acres. See EIS, Chapter 2 for discussion on planting design (i.e., founder stands).
- Alternative 4 includes manually applying herbicides (glyphosate) on up to 4,012 acres to initially ensure limited vegetation competition to the planted seedlings and to maintain a buffer of 25 feet to 50 feet around Founder Stands. Manage the buffer to maintain a lower brush component to reduce fire spread and increase fire resilience within the planted areas.
- Alternative 4 treats 50% of the reforested areas (7,186 acres) and 50% (8,746 acres) of the complex early seral forest with prescribed fire within one fire return interval (approximately 10 years). Use a tractor to line the plantations prior to burning, where needed. Prescribed fire would be returned to the other 50% of the areas (15,932 acres) in the second decade and then repeated through time. The emphasis is on returning fire to this landscape.
- Alternative 4 includes similar understory burning and thinning on 12,768 acres in existing plantations as Alternative 1.

Management Requirements Specific to Alternative 4

No terrestrial wildlife Management Requirements specific to Alternative 4, see Management Requirements Common to all Alternatives.

ALTERNATIVE 5

Alternative 5 responds to the significant issues and concerns identified through public scoping (Chapter 1.08). Compared to Alternative 1, it addresses those issues by proposing: planting at a denser 7-foot by 14-foot spacing throughout deer habitat enhancement areas, natural regeneration units and reforestation units that include thinning into an open mosaic structure. This would result in a 6 to 8-foot by 12 to 16-foot spacing when applied on the ground at 444 trees per acre.

- Alternative 5 includes similar deer habitat enhancement treatments as Alternative 1 on 3,836 acres. Unlike Alternative 1, Alternative 5 plants the 679 acres of deer habitat enhancement areas on 7 by 14-foot spacing and if necessary uses thinning to accomplish the desired mosaic structure. Initiate the thinning as early as 7 years post-planting after the trees have expressed dominance and site occupancy.
- The 4,031 acres proposed for natural regeneration under Alternative 1 would be treated using the Alternative 5 reforestation prescription and is included in the acreage listed under reforestation.
- Alternative 5 includes similar noxious weed eradication as Alternative 1 on 5,714 acres, emphasizing the use of herbicides. The majority of the noxious weed treatments are within the reforestation units.
- Alternative 5 includes similar reforestation treatments as Alternative 1 and includes the 4,031 natural regeneration areas for a total of the same 25,331 acres. While planting design is modified from Alternative 1, long-term desired conditions are the same as Alternative l.
- Alternative 5 includes similar release treatments as Alternative 1 and includes the additional 4,031 acres of natural regeneration acres to manually apply herbicides (glyphosate) on up to 25,331 acres.
- Unlike Alternative 1, Alternative 5 does not include prescribed fire in new plantations within the first 10 years.
- If desired ICO structure is not created through oak buffers, riparian species, seedling mortality, and other factors, plantations could be thinned to achieve the desired ICO structure based on landscape position and SFMA. Thinning could be initiated as early as 7 years post-planting once the trees have expressed dominance and site occupancy.
- Alternative 5 includes similar understory burning and thinning on 12,769 acres in existing plantations as described in Alternative 1.

Management Requirements Specific to Alternative 5

No terrestrial wildlife Management Requirements specific to Alternative 5, see Management Requirements Common to all Alternatives.

Management Requirements (Terrestrial Wildlife) Common to All Action Alternatives

1. Snags and down woody material.
    a. Snag retention in OFEA and Home Range Core Area (HRCA) units: Retain all hardwood snags greater than or equal to 12 inches diameter at breast height (dbh). Retain an average of 30 square feet of basal area of conifer snags across each unit by starting at the largest snag and working down, with a minimum of four and a maximum of 6 per acre. Do not leave snags along roadsides, critical ridge areas, identified fuel breaks or within 1 tree length of any infrastructure.
    b. In general forest units and outside of fuelbreaks, retain 1) all hardwood snags greater than 12 inches dbh and 2) retain the largest conifer snags greater than 15 inches dbh at the rate of 4 per acre on a unit basis.
    c. In existing plantation units and outside of fuelbreaks, retain 1) all hardwood snags greater than 12 inches dbh and 2) retain the largest conifer snags available at the rate of 4 per acre on a unit basis.
    d. Retain 5 of the largest down logs per acre on a unit basis. Use logs greater than or equal to 20 inches dbh and at least 20 feet long to meet this requirement where available. Retained down logs should be greater than 100 feet from roadsides.
    e. Retain all conifer snags greater than 15 inches and hardwood snags greater than 12 inches dbh in units GG063, HH014, R037, and R039.
    f. Inside Strategic Fire Management Areas; retain up to 6 hardwood snags greater than 15 inches dbh per acre. Minimize damage to re-sprouting oaks when removing hardwood snags by directionally felling away from the largest sprout where feasible and avoiding hitting the stump while moving the downed material.
    g. Retain high capability habitat for black-backed woodpeckers in units HH029, HH031, K013, K018, L002, L003, L005, N010, and N019 eight years post-fire, beginning reforestation efforts no sooner than 2021.
2. Plant blue oaks if needed to supplement natural regeneration in units R041, S004 T021, and T024.
3. Maintain a Limited Operating Period (LOP) prohibiting mechanical operations within 0.25 mile of a protected activity center (PAC) during the breeding season for California spotted owls (March 1 through August 15), northern goshawks (February 15 through September 15), great gray owls (March 1 through August 15) and within 0.5 miles of the known bald eagle nest (January 1 through August 31) unless surveys conducted by a Forest Service biologist confirm non-nesting status. LOPs may be reduced to a 0.25 mile area around a nest site if surveys are conducted.
4. Prior to pile burning, coordinate with District Wildlife Biologist to ensure disturbance to sensitive species does not occur.
5. Conduct surveys in compliance with the Pacific Southwest Region's survey protocols to establish or confirm the location of the nest activity center for spotted owl, great gray owl and goshawk.
6. Flag and avoid elderberry plants greater than one inch stem in unit Z030.
    a. Prohibit ground based mechanical operations and burning within 10 feet of elderberry plants.

b. Maintain an LOP prohibiting pile burning and mechanical activities within 100 feet of flagged shrubs from April 1 through June 30 to avoid fire and dust impacts to valley elderberry longhorn beetles.
c. If additional elderberry shrubs with stems over 1 inch diameter are found prior to or during project implementation, they will be similarly avoided and the District wildlife biologist will be notified immediately.

7. Notify the District Wildlife Biologist if any Federally Threatened, Endangered, Candidate species or any Region 5 Forest Service Sensitive species are discovered during project implementation so that LOPs or other protective measures can be applied, if needed.

4. EXISTING CONDITION

PROJECT ACTION AREA

The Rim Fire area occurs at elevations ranging from about 1,000-7,000 feet and encompasses portions of the Clavey River, Cherry Creek, North, Middle, and South Fork Tuolumne River, North Fork Merced, and Tuolumne River-Don Pedro Reservoir 5th level watersheds, on the west slope of the Sierra Nevada. The Rim Fire Recovery Decision (2014) included removal of fire killed trees through salvage and fuels reduction treatments on about 42,300 acres. This project is the next phase in restoring this landscape and includes options to reforest salvaged or high severity burned areas.

This post-fire landscape is comprised of vegetative communities including grassland, meadows, oak woodlands, chaparral, lower westside ponderosa pine, mixed conifer and high elevation true fir and lodgepole pine. The majority of forested area is Sierran Mixed Conifer, which includes ponderosa pine, incense cedar, white fir, sugar pine, and black oak. Plantations are also present throughout the project area and consist mainly of ponderosa pine. Other tree species found less frequently include live oak, cottonwood, alder, birch, and Douglas fir. Shrub species present include greenleaf and white leaf manzanita, deer brush, chinquapin, mountain whitethorn, buck brush, gooseberry, toyon, and birch leaf mountain mahogany.

The Rim Fire resulted in dramatic changes to habitat availability and distribution across the landscape. Table 3.16-2 displays the dominant habitat types present within the project area post-fire.

Table 3.16-2 Dominant habitat types within the Rim Fire or project area

CWHR Habitat Type	Post Fire (acres)
Blue Oak Woodland and Blue Oak-Foothill Pine	2,086
Chaparral	83,400
Grassland (annual & perennial)	18,400
Jeffrey Pine	7,000
Lodgepole Pine	400
Montane Hardwood	32,000
Montane Hardwood-Conifer	8,500
Ponderosa Pine	18,400
Red Fir	2,500
Sierran Mixed Conifer	74,000
Subalpine Conifer	700
White Fir	1,950

A diverse array of terrestrial wildlife species occur across the landscape, an indication of the diverse habitats available. The Rim Fire resulted in changes to most habitat types and therefore affected wildlife species to varying degrees. Some common species encountered throughout the area include northern flickers, nuthatches, great horned and western screech owls, white-headed and pileated woodpeckers, band-tailed pigeons, California and mountain quail, Douglas and gray squirrels, long-tailed weasels, raccoons, bobcats, mountain lions, bear, coyotes, and mule deer. Some less common species found in the area include northern goshawks, California spotted owls, and great gray owls, all Region 5 Forest Service Sensitive species. Although Pacific marten and fisher are not documented to occur on the Stanislaus National Forest within the fire perimeter, they are known to occur in close proximity and are also Region 5 Forest Service Sensitive species.

Habitat connectivity across the landscape is critical to wildlife as it provides a means for dispersal, linkages between suitable habitat patches or core habitat areas, and genetic exchange. The Rim Fire resulted in reducing forest habitat connectivity at various scales, affecting habitat availability and wildlife movement. Cover in high severity burned areas has been compromised and wildlife responses to this include: avoidance, modified use, or increased use as vegetation becomes re-established. Fire adapted species are expected to increase use of this post-fire landscape. Unsuitable habitat can be an effective barrier, isolating suitable habitat patches for a given species because of reduced connectivity. Reforestation is an effective way of restoring and reestablishing suitable habitat and connectivity within an animals breeding territory, home range, and across the greater landscape.

Key habitat elements commonly used by wildlife include: downed woody debris and snags in various stages of decay, understory vegetation, large trees with deeply fissured bark and cat faces, closed and open canopies, and defective trees with mistletoe, broken tops, and cavities. Pre-existing snags and downed woody material were lost as a result of the Rim Fire, while some areas were already void of these features pre-fire. Snags were also created as a result of the fire. Snags and downed logs were purposefully retained as part of the 2014 Rim Fire Recovery Decision because of the value they provide to wildlife, soils, and future forest development. Retaining these key habitat elements, where they exist across the landscape, provides structural complexity, are critical to many wildlife species, and are known to increase wildlife diversity when present.

5. ASSUMPTIONS

While some of these assumptions may be debatable, the comparison of alternatives using these assumptions is valid because the same assumptions are applied to all alternatives.

- All standards and guidelines, standard operating procedures, project design features, management requirements, and mitigations would be fully adhered to and implemented.
- Implementation of project activities would generally occur in the following timeframes: fuels treatments, reforestation and release treatments, and prescribed burning 2017-2029.
- For the snag retention management requirement in Old Forest Emphasis Area (OFEA) and Home Range Core Area (HRCA) units, intent is to retain legacy structure where it exists for long-term resource recovery needs (i.e. the development of future old forest habitat with higher than average levels of large conifer snags and down woody material). Retention of all hardwood snags outside Strategic Fire Management Areas and up to six hardwood snags inside Strategic Fire Management Areas greater than or equal to 12 inches diameter at breast height (dbh). In all units, retention of 30 square feet basal area of conifer snags per acre are required and would be selected by starting at the largest snag and working down, with a minimum of four and a maximum of six per acre (the maximum number was identified to meet economic and fuel reduction objectives in the purpose and need). We assume based on pre-fire stand exam data that on average this would

result In retention of six 30" dbh snags per acre on a unit basis (six 30" dbh trees = 30 square feet basal area per acre). This requirement applies to all action Alternatives.

- For the snag retention management requirements in General Forest and other land allocations not managed for old forest emphasis objectives, intent is to retain snags in patches, avoiding uniformity across large areas. Retention of all hardwood snags outside Strategic Fire Management Areas and up to six hardwood snags inside Strategic Fire Management Areas greater than or equal to 12 inches diameter at breast height (dbh). In all General Forest units, retention of the largest conifer snags > 15" dbh would occur at the rate of 4 per acre on a unit basis. We assume based on pre-fire stand exam data that this is equivalent to an approximate basal area retention rate of 12 square feet per acre (four 24" dbh trees = 12 square feet basal area per acre). This requirement applies to all action alternatives.
- Unit boundaries were developed using GIS data at various scales. The level of inaccuracy of a line on a map at most scales used was approximately 20 feet. When utilizing these data on the ground, some variation in unit boundaries may occur. The scope of these variations was considered in our effects analysis.
- Suitable habitat acres were generated using ArcGIS and several data sources. At the scale of my analysis, up to 257,000 acres, rounding errors are likely to cause slight variation in acres when presented under different species sections. These slight variations are considered minimal and have no measureable effect on the accuracy of the analysis presented herein.
- All mechanical prep methods and equipment used for site prep, as described in the EIS, would have similar impacts to wildlife resources.

6. DATA SOURCES

- California Wildlife Habitat Relationships (CWHR).
- California Natural Diversity Database (CNDDB).
- Natural Resource Information System (NRIS Wildlife, 2015).
- Black-backed woodpecker occupancy model by Tingley et al. 2014a.
- GIS layers including: RAVG database, Worldview Imagery, Stanislaus vegetation database, land allocations, project unit boundaries and road treatments.
- Project survey reports and incidental detection records.
- Scientific literature, internal and draft reports.

7. EFFECTS OF THE PROJECT ALTERNATIVES

The following section includes species and habitat accounts along with effects analysis for all alternatives considered in detail. Not all actions proposed under the alternatives would affect terrestrial wildlife; therefore, only actions that would have measureable effects are considered in this document. Those actions that could have measureable effects on wildlife were used to identify the indicators used to analyze and compare effects among alternatives.

DIRECT AND INDIRECT EFFECTS

Direct effects are effects that are caused by the action and occur at the same time and place. Indirect effects are effects that are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable 40 CFR 1508.8.

Project Action Area

Unless otherwise specified, the analysis area used to analyze the direct and indirect effects on wildlife and wildlife habitat is about 155,000 acres and includes Stanislaus National Forest System lands within the Rim Fire perimeter. The analysis area is based on 1) acres burned in a distinct geographic area and administrative setting that influences the purpose and need of proposed activities, 2) area of impact to forest vegetation from the wildfire and subsequent proposed project activities, 3) furthest measurable extent of changes to disturbance levels and habitat modification that would occur as a result of implementing any of the proposed alternatives, and 4) consistency with the analysis area described in the Rim Fire Reforestation EIS reports for fire and fuels, soils, and vegetation because ecologically, the dynamics among these elements are inherently linked with terrestrial wildlife habitat. This analysis is bounded in time for short-term effects (up to 20 years) and long-term effects (up to 80 years). I chose to use 80 years for the long-term analysis because that is when the modeling shows forested habitat reaching that stage of moderate to high capability for the majority of species considered in this report. This timeframe is used to serve for relative analysis comparisons between the alternatives.

CUMULATIVE EFFECTS

According to the Council on Environmental Quality (CEQ) NEPA regulations, "cumulative impact" is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions (40 CFR 1508.7).

The analysis area used to analyze the cumulative effects on wildlife and wildlife habitat is about 257,000 and includes all lands within the Rim Fire perimeter. The analysis area is based on 1) treatments are proposed in and would modify burned areas within the Rim Fire area only, 2) this area provides an appropriate context for the reasonable determination of effects to species considered herein and their habitat, and 3) relevant cumulative effects, particularly other projects that have or will treat areas within the fire perimeter, can be effectively and meaningfully addressed. This analysis is bounded in time for short-term effects (up to 20 years) and long-term effects (up to 80 years). This analysis relies on current environmental conditions as a proxy for the impacts of past actions; see Appendix B, Rim Fire Reforestation EIS. Existing conditions reflect the aggregate impact of all prior human actions and natural events that affected the environment and might contribute to cumulative effects. All activities listed and described in this appendix are not expected to affect all species considered in this document. See individual species analysis sections for further discussion of relevant present and reasonably foreseeable future actions.

TERRESTRIAL WILDLIFE

Terrestrial Wildlife: Herbicide Risk Assessment (toxicological effects)

Under Alternatives 1 and 5, an Integrated Pest Management (IPM) approach is proposed for weed eradication, which includes the use of herbicides. Herbicide use is also proposed in reforestation units for site prep and release. Under Alternative 4, herbicides are proposed for reforestation areas only, not weed eradication. See Chapter 2 in the Rim Reforestation EIS for additional details. This analysis covers the worst case scenario, or application of herbicides on the maximum number of acres. While spraying every acre is unlikely and would vary across the project area depending on vegetation composition and response, this analysis will inform the reader of the maximum effects possible to terrestrial wildlife. Under Alternatives 1 and 5, four herbicides are proposed for use to control noxious weeds and reduce competing vegetation for newly planted conifers. There is overlap in

treatment areas for weeds and conifer planting, thus acres may be double counted in some instances. The herbicides proposed for use under Alternatives 1 and 5 are Glyphosate, Clopyralid, Clethodim, and Aminopyralid. The herbicide proposed for use under Alternative 4 is glyphosate and would only be used for site prep and release in reforestation units. Herbicides would be applied using low pressure backpack sprayers with a psi of about 15.

***Reforestation*:** Under Alternatives 1 and 5, up to about 26,000 acres would be sprayed with glyphosate for either site prep or release treatments (Chapter 2, Rim Reforestation EIS). It is important to note that not every part of any given acre would actually be sprayed. There are several management requirements and topographical constraints that would reduce the amount of acres sprayed including; oak buffers, sensitive plant and cultural sites, retention of up to 20 percent vegetation on an acre before spraying would be triggered, and inoperable areas. Treatments would be spread across the project area, with different units being treated over multiple years. The treatments would be phased in; meaning only a portion of the total acreage would be treated any given year. See Appendix R in the Rim Reforestation EIS for the implementation schedule and associated acres. The maximum number of treatments would be three if deep tilling is used for site prep and four if deep tilling is not used for site prep. The first year of spraying is considered the worst case scenario as subsequent years would likely require less intensive treatment based on the first year's application results.

Under Alternative 4, up to about 4,130 acres would be sprayed with glyphosate for either site prep or release treatments (Chapter 2, Rim Reforestation EIS). Treatments would be spread across the project area, with different units being treated over a few years. See Appendix R in the Rim Reforestation EIS for the implementation schedule and associated acres.

Noxious Weeds: The chemicals proposed for noxious weed treatments include glyphosate, chlopyralid, aminopyralid, and clethodim. Treatments would be conducted over multiple years, see Appendix N in the Rim Reforestation EIS for the implementation schedule and associated acres. The first year of treatments is considered the worst case scenario and follow up treatments are expected to be less intensive as infestations are reduced. The majority of the noxious weed treatments are within reforestation units. Under Alternative 4, no herbicides are proposed for noxious weed treatments.

Formal risk assessments were completed for all herbicides proposed for use in this project. The SERA risk assessments (SERA 2004, 2011, 2014), associated worksheets, and Rim Reforestation EIS are hereby incorporated by reference and provide more detailed discussion, assumptions and validation of this risk assessment. Risk assessments can be used to determine the ecological risk to individuals exposed to concentrations of chemicals in the open environment, aquatically or terrestrially. Exposure risk is, in part, determined by comparing estimates of expected environmental concentrations (EEC) derived from modeled outputs to toxicity values established for the species or a surrogate for the species of concern. These EECs for acute and chronic scenarios are then compared to available toxicity data for terrestrial species, producing a hazard quotient (HQ, HQ = EEC/toxicity). These models consider typical (center), low, and high values for exposure and the resulting hazard quotient. The smaller the HQ, the lower the risk is to individuals. Conversely, as the HQ approaches or exceeds equity (i.e., a value of one (1)), there is a greater risk that there could be a toxicological effect to an individual. For acute and chronic exposures, the Forest Service has adopted a toxicity threshold of NOAEL, or the no observable adverse effect level. NOAEL values are based on longer term studies of organisms exposed to low concentrations of chemicals that are used to determine whether there are physiological or generational effects.

Chemical Descriptions

GLYPHOSATE: Glyphosate is a broad-spectrum foliar herbicide and could be used on several noxious weeds and competing vegetation effectively. Glyphosate is relatively immobile in most soil environments as a result of its strong adsorption to soil particles with a low leaching potential.

Glyphosate on vegetation has a half-life estimated at 10 days. Glyphosate is rapidly metabolized by an animal's kidneys and excreted in waste products (SERA 2011). It is not known to bioaccumulate in animal fat or other body tissues; therefore, the risk to predators, such as fisher or spotted owls, of consuming herbivores is very low.

CLOPYRALID: Clopyralid is a selective herbicide used primarily in the control of broadleaf weeds, mainly thistles. It is mostly effectively used as a post emergent because it is rapidly absorbed across leaf surfaces. It does not bind tightly with soil and there is risk of leaching. However, this potential risk is reduced by the relatively rapid degradation of clopyralid in soil. The half- life of clopyralid on vegetation is about 8 days and in soil about 10 to 19 days (SERA 2004). Toxicity has been relatively well characterized in experimental animals, and some additional studies on birds, bees, spiders, and earthworms generally support the characterization of clopyralid as relatively non-toxic. No adverse effects are anticipated or even considered plausible in terrestrial animals from the use of clopyralid in Forest Service programs at the typical application rate of 0.35 lb a.e./acre (Ibid). It is important to note that the typical application rate is 0.10 lb a.e./acre higher than is proposed in this project.

AMINOPYRALID: Aminopyralid is a selective herbicide used primarily in the control of broadleaf weeds, mainly thistles (SERA 2004). Very little information is available regarding aminopyralid in open literature because it is a new herbicide. It is in the same class of herbicides as and on some occasions as an alternative for clopyralid. It is most often applied to the vegetation as a post emergent. Aminopyralid on vegetation has a half-life estimated at 10-16 days and in soil an estimated half-life of 25-35 days (Ibid). There is no indication that mammals, birds, or terrestrial invertebrates would be adversely affected by aminopyralid (Ibid).

CLETHODIM: Clethodim is a selective post-emergence herbicide used for the control of annual or perennial grass weeds, such as medusahead and barbed goatgrass (SERA 2014). Risks to mammals can be well characterized but it is more difficult to characterize risks to other groups of terrestrial animals because of limitations in the available data on birds and terrestrial insects (Ibid). Serious effects to mammals do not seem likely and the potential for direct effects to birds associated with acute exposures appears to be low. Limitations with the risk assessment on clethodim involves the small number of species on which toxicity data are available relative to the large number of species that may be exposed. This limitation is exacerbated by the lack of field studies relevant to the assessment of the effects of clethodim applications on most groups of non-target species.

Based on acute toxicity, U/s/ EPA/OPP classify clethodim as practically non-toxic to mammals, birds, and honeybees. Field studies to investigate the impact of clethodim on mammalian wildlife were not found in the literature; however, body weight loss or decreased body weight gain is the most consistent effect observed in experimental mammals exposed to clethodim in acute, sub chronic, and chronic studies (Ibid). In one reproductive study in quail, clethodim did not have an impact on the body weights of adults or offspring. Based on the LC_{50} of >100 µg/bee for technical grade clethodim, U.S. EPA/OPP/EFED classifies clethodim as practically nontoxic to honeybees and is considered a functional NOAEL (Ibid).

SURFACTANT: Syl-TacTM is the non-ionic surfactant proposed for use with the glyphosate. It is a blend of two products, Hasten® and Sylgard® 309. Hasten® is a methylated seed oil concentrate used to increase the penetration of the herbicide into the plant. The product label carries a "Caution" signal word and indicates it may be irritating to the skin and to the eyes. The main ingredient in Hasten® contained in the Syl-tac™ product is esterified canola seed oil. The MSDS lists isopropylamine as a hazardous ingredient at levels of 2% in the formulation (SERA 2007). Sylgard® 309 is a silicone surfactant which allows the chemical to adhere to the hydrophobic surface of vegetation. The product label carries a "Warning" signal word and it is considered slightly irritating to the skin and is considered severely irritating to the eyes. The MSDS describes a 28-day oral dosing study in rats, in which rats were fed doses of 0, 33, 300, or 1,000 mg/kg/day. No significant findings

of biological relevance were seen in females, while males showed some effects at highest dose (body weight gain, and changes in food consumption). This would indicate a subchronic NOEL of 300 mg/kg/day (SERA 2007). Because such a small amount of the surfactant would be used with glyphosate, and due to the fact that it is only considered slightly irritating to the skin and eyes, no further analysis is warranted.

COLORANT: ColorfastTM Purple (SERA 1997; USDA 2007) – Colorfast™ Purple dye is not required to be registered, therefore it has no signal word associated with it. It is mildly irritating to the skin, but because of the acetic acid content, can be severely irritating to the eyes, and can cause permanent damage. The label requires the use of acid-resistant gloves and goggles to prevent unnecessary exposures. It would likely be considered a Category I material and have a "Danger" signal word if it carried one. Acetic acid is the ingredient in household vinegar, although vinegars are normally 4-10% acetic acid, whereas Colorfast™ Purple contains 23.4% by weight. Acetic acid is a very strong eye and skin irritant, and eye exposure can be very hazardous, with permanent damage a possibility.

Gentian Violet, a chloride salt, is the dye component of Colorfast™ Purple. It is used as an antifungal or antibacterial medication for dermal or mucous membrane infections. In rats, there is an indication that the dye accelerates the development of leukemia; however, the effect is less remarkable than that observed in mice. It is of moderate acute toxicity, with a LD50 value of 96 mg/kg.

According to the human health risk analysis done by SERA 1997, there are no exposure effects to workers at the maximum concentration application rate of 0.05% dye/solution. The dose level for workers is expected to be much higher than would be absorbed by small or large mammals. From this analysis, it can be deduced that cancer risk to mammals from dermal exposure would be low. Spills or accidents could result in concentrations sufficiently high to cause effects. Utilizing backpack sprayers should minimize application zones and thus dermal contact. Therefore, it is unlikely that with the recommended application rate and method (0.0025% dye/solution), there would be any adverse effects to mammals. For birds, little research has been done. Turkeys exposed to this dye in drinking water contracted occlusive laryngotracheitis (Clark et al. 1993 in *SERA* 1997). The concentration in the drinking water was undetermined; therefore, no reference toxicology data can be inferred. Because there is minimal risk to mammals and birds based on the dose level, no further analysis is warranted.

Surrogate Species

Toxicological effects studies of herbicide use on wild animals are almost non-existent. Specifically, TES species are not tested directly, thus the need for surrogate species that can represent others is necessary for herbicide risk assessments and the application of chemicals. It is important to note a surrogate species may not accurately represent the species of concern, thus caution should be applied to the results of ecological risk assessments and the use of surrogate species. A large number of tests have been conducted using more readily available animals exposed to chemicals using standardized methods, which serve as surrogate species. Some surrogate species included in the risk assessment scenarios include honey bees, goats, rats, rabbits, and bobwhite quail.

Types of Exposure

Herbicides have the potential to directly and indirectly affect terrestrial wildlife species and habitats through exposure and contamination resulting from direct spraying of an individual, ingestion of contaminated media (e.g., vegetation, prey species, or water), grooming activities, or indirect contact with contaminated vegetation (SERA 2004, 2011, 2014). Direct and indirect effects to individuals in either aquatic or terrestrial habitats are dependent upon the toxicity of the chemicals being used, the exposure levels to which the individuals are likely to be subjected, and the likelihood that an individual would be exposed to the chemicals. Further, to fully evaluate the risk and potential effects, the dose and exposure information (toxicity and EEC values, respectively) must be related to the life

history characteristics of the animal to estimate the likelihood that an animal would be exposed to the chemicals.

Complete exposure assessments, toxicity values, toxicological thresholds, and hazard quotients for all chemicals proposed in this project are available in the project record and are hereby incorporated by reference. Summary tables for scenarios considered in this assessment are provided for easy reference.

For this assessment, the following species are considered: bald eagle, black-backed woodpecker, California spotted owl, great gray owl, fringed myotis, pallid bat, Townsend's big-eared bat, fisher, marten, mule deer, and western bumblebee. Because we would employ a 100 foot buffer with no herbicide application around any elderberry shrub, no toxicological effects to VELB or elderberry shrubs from herbicide application are expected; therefore, no further analysis is warranted.

Scenarios

The following species life histories, existing habitat conditions, and likely types of exposure were used to choose appropriate scenarios considered in this analysis for glyphosate, Clopyralid, aminopyralid, and clethodim. All scenarios were considered and analyzed under all chemicals unless noted otherwise.

***Fisher and marten*:** Fisher and marten are wide ranging meso-carnivores with large home ranges and a preference for late seral forested habitats. Fishers have been documented to move up to 3 miles per day and are active day or night. Marten exhibit similar habits, traveling long distances and being active day or night. They forage opportunistically on a diet that varies both seasonally and geographically which includes small mammals, birds, insects, fruits, berries, fungi, and reptiles. Fisher and marten are uncommon and sensitive to human disturbance. Neither species has been documented in the project area.

The areas proposed for herbicide treatments include potential foraging and dispersal habitat for marten and fisher.

Reforestation: After the initial herbicide treatment, understory vegetation is expected to be much reduced, thus these areas would be of much less utility as foraging habitat because prey such as small mammals and birds rely on understory vegetation for cover and food. It is plausible that the remaining root systems of treated shrubs would still provide subnivean habitat for mice or ground squirrels; however, the temperature regime just below the surface would be changed because of the reduction of foliar cover above ground and may become unsuitable for animals using the upper soil profile for burrows. It is likely that any individual fisher or marten in this area would be traveling in adjacent green forest not proposed for treatments in this project. Because of their avoidance of open areas, it is unlikely that they would spend much time in the affected area, especially after the first year of treatment other than to inspect the now readily visible burrow holes or pockets of untreated vegetation within treated units.

Weeds: Chemicals would be applied by targeting each plant, not broadcast spraying, so the number of non-targeted plants being sprayed would be minimal.

The likely types of exposure considered in this assessment for marten and fisher would be ingestion of contaminated prey (small mammals), fruit, or contaminated water (non-accidental acute and chronic). Because of their sensitivity to disturbance and human presence, any individuals in the treatment area would likely be flushed and displaced during implementation. Thus, the scenario describing direct spraying of an individual is discountable and is not evaluated in this assessment.

The scenario representing the ingestion of a contaminated small mammal is that of a mid-sized, carnivorous mammal eating a small mammal that has just been sprayed with glyphosate. Individual fisher or marten would be at greatest risk of being exposed if they were foraging through the area

immediately after spraying occurred or within a few days. If a small mammal were directly sprayed, it would likely immediately begin grooming its fur, which is a normal behavioral response when foreign objects (solid or liquid) are introduced to an animal's fur.

The scenarios representing the ingestion of contaminated fruit or vegetation is a larger mammal or large mammal consuming fruit or short grass that has been directly sprayed with chemical. It is possible that individual fisher or marten could forage on berries present on treated shrubs. The larger mammal weight is set at 0.4 kg and the large mammal weight is set at 70kg, neither of which is close to the weight of a fisher or marten (1-4 kg), thus I chose to show both scenarios which represent animals smaller and larger than the species of concern. Fisher and marten are considered bounded by these scenarios.

The scenario representing the ingestion of contaminated water is that of a mid-sized, carnivorous mammal drinking from surface water that has been contaminated. Exposure to contaminated water is modeled to estimate glyphosate concentrations in water using a Gleams-Driver model. This model estimates peak and longer-term pesticide concentrations in surface water. HQs for mammals are derived when modeled concentration rates are combined with the mammal's weight and amount of water consumed.

***Mule deer*:** Mule deer are wide ranging herbivores that utilize a variety of vegetation types including oak woodlands, coniferous forest, meadows and grasslands, chaparral and riparian corridors. They browse or graze, showing preferences for forbs and grasses, as well as tender new shoots on various shrub species including mazanita, ceanothus, mountain mahogany, and bitterbrush.

Reforestation and weeds: The areas proposed for herbicide treatments include suitable transition and concentration habitat, as well as critical winter range. The most likely exposure for deer is when foraging during early spring and summer, which would encompass critical winter range and migratory or transition range. The likely types of exposure considered in this analysis for mule deer would be ingestion of contaminated fruit, vegetation, and water. Because of their sensitivity to disturbance and human presence, any individuals in the treatment area would likely be flushed and displaced during implementation. Thus, the scenario describing direct spraying of an individual is discountable and is not evaluated in this assessment.

The scenarios representing the ingestion of contaminated fruit or vegetation is a larger mammal (70 kg, or generally the size of an adult mule deer) consuming fruit, broadleaf foliage, tall or short grass that has been directly sprayed with chemical. These scenarios are run for both acute and chronic exposure, use residue rates, and relate to the amount of contaminated food eaten per day.

The scenario representing the ingestion of contaminated water is that of a large herbivorous mammal drinking from surface water that has been contaminated. Exposure to contaminated water is modeled to estimate glyphosate concentrations in water using a Gleams-Driver model. This model estimates peak and longer-term pesticide concentrations in surface water. HQs for mammals are derived when modeled concentration rates are combined with the mammal's weight and amount of water consumed.

***Pallid, big-eared, and fringed myotis bats*:** Bats are found in various habitat types such as forests, woodlands, grasslands, meadows and riparian corridors. They roost in buildings, under bridges, in rock crevices, foliage, and trees. Day roosts are usually enclosed locations such as rock crevices or hollowed out snags where they can remain undetected by potential predators. Most bats are sensitive to disturbance at roost sites. Bats can travel over a mile to favorite foraging locations. They forage at night exclusively on insects, using open habitats such as meadows, forest edges, or riparian corridors. See species account section in this document for more life history information for these species.

Reforestation and weeds: The areas proposed for herbicide treatments includes suitable foraging and travelling habitat for fringed myotis, pallid bats and big-eared bats. The most likely exposure for

fringed myotis, pallid or big-eared bats is during foraging bouts along forest edges or while traveling on their way to a suitable foraging location. Thus, the likely types of exposure considered in this assessment for bats would be ingestion of contaminated prey (insects) and ingestion of contaminated water (non-accidental-acute and chronic). Because they are nocturnal, foraging at night, the scenario describing direct spraying of an individual is discountable and is not evaluated in this assessment.

The scenario representing the ingestion of contaminated insects is that of a small mammal eating insects that have just been sprayed with chemical. At first glance, it may seem that the scenario of birds eating insects would serve as a better surrogate given the similarities between the foraging behaviors of bats and birds. Studies of the similarity of toxicological effects have found more consistent results within more closely related species, thus the scenario using small mammals was chosen for this assessment (SERA 2011). Individual bats would be at greatest risk of being exposed if they were foraging or traveling through the area and consumed contaminated insects either immediately or within a few days after spraying occurred. Insects are less likely to escape the immediate area during spraying and thus are more likely to be directly exposed to herbicides; however, insects may also be afforded some protection if they are underneath or somewhat shielded from direct application by foliage or branches. Most insects preyed upon by bats (moths, scorpions, cicadas) are active at night and would likely be located in protected locations during spraying activities which occur in the daytime.

The scenario representing the ingestion of contaminated water is that of a small mammal drinking from surface water that has been contaminated. Exposure to contaminated water is modeled to estimate glyphosate concentrations in water using a Gleams-Driver model. This model estimates peak and longer-term pesticide concentrations in surface water. HQs for mammals are derived when modeled concentration rates are combined with the mammal's weight and amount of water consumed.

Bald eagle, great gray owl, goshawk & spotted owl: Great gray owls, goshawks and spotted owls are found in late seral forested habitats, great gray owls are closely associated with meadows. Bald eagles are closely associated with lake areas. Eagles rely on prey that are; dead, dying, or otherwise vulnerable. They eat fish, rabbits, waterfowl, and mammals. Owls and goshawks are carnivorous predators that forage over large areas consuming prey items such as squirrels, small birds, woodrats, mice, gophers, and voles. They typically hunt from perches and on the wing. All these species are sensitive to disturbance and human presence. There are several great gray owl, spotted owl, and goshawk territories throughout the project area and in close proximity to treatment units. There is one bald eagle breeding territory at Cherry Lake. See species account section in this document for more life history information for these species.

Reforestation: The areas proposed for herbicide treatments includes potential foraging habitat for bald eagles, great gray owls, goshawks, and spotted owls. After the initial herbicide treatment, understory vegetation is expected to be much reduced, thus the area would be of much less utility as foraging habitat because prey such as small mammals and birds rely on understory vegetation for cover and food. It is plausible that the remaining root systems of treated shrubs would still provide subnivean habitat for mice or ground squirrels; however, the temperature regime just below the surface would be changed because of the reduction of foliar cover above ground and may become unsuitable for animals using the upper soil profile for burrows. It is likely that any individual eagles, owls or goshawks in this area would be utilizing adjacent green forest and edge habitat not proposed for treatments in this project.

Weeds: Chemicals would be applied by targeting each plant, not broadcast spraying, so the number of non-targeted plants being sprayed would be minimal.

The likely types of exposure considered in this assessment for bald eagles, owls and goshawks would be ingestion of contaminated prey (small mammals or fish) or contaminated water (non-accidental

acute and chronic). Because these species are highly mobile, sensitive to human disturbance, and some mostly forage at night, the scenario describing direct spraying of an individual is discountable and is not evaluated in this assessment.

The scenario representing the ingestion of a contaminated small mammal is that of a carnivorous bird eating a small mammal that has just been sprayed with chemical. Individuals would be at greatest risk of being exposed if they were foraging through the area either immediately or within a few days after spraying occurred. If a small mammal were directly sprayed, it would likely immediately begin grooming its fur, which is a normal behavioral response when foreign objects (solid or liquid) are introduced to an animal's fur.

The scenario representing ingestion of a contaminated fish looks at the proportion of a bird's daily diet that is comprised of contaminated fish. The upper limit HQ assumes 100 percent of the bird's daily food consumption is contaminated fish.

Exposure to contaminated water is modeled to estimate glyphosate concentrations in water using a Gleams-Driver model. This model estimates peak and longer-term pesticide concentrations in surface water. HQs for birds are derived when modeled concentration rates are combined with the bird's weight and amount of water consumed. The small bird used in this scenario weighs 0.1kg and the large bird weighs 4kg, neither of which is close to the weight of great gray owls, spotted owls, or goshawks (0.5 – 0.9 kg), thus I chose to show both scenarios which represent animals smaller and larger than the species of concern. These species are considered bounded by these scenarios. Bald eagles are represented by the large bird scenario because they weigh about the same. It is assumed that great gray owls, spotted owls, and goshawks would fall somewhere between the values for the birds in these scenarios.

Black-backed woodpeckers*:* Black-backed woodpeckers are closely associated with burned forest, although they do use green forest as well. Black-backed woodpeckers readily forage on larvae of wood-boring beetles, engraver beetles, and mountain pine beetles found in the trunks of burned conifers (Dixon and Saab 2000). There have been black-backed woodpeckers documented in the project area in very low numbers. See species account section in this document for more life history information for these species.

Reforestation and weeds: The areas proposed for herbicide treatments include relatively poor foraging habitat for black-backed woodpeckers. There are snags in the proposed treatment areas that would provide small areas in which they would forage. It is more likely that individual woodpeckers would be utilizing adjacent burned forest or snags in green forest not proposed for treatments in this project. The likely types of exposure considered in this assessment for black-backed woodpeckers would be ingestion of contaminated prey (insects), fruit or water (non-accidental acute and chronic). Because these species are highly mobile, the scenario describing direct spraying of an individual is discountable and is not evaluated in this assessment.

The scenario representing the ingestion of contaminated insects is that of a bird eating insects that have just been sprayed with chemical. Individuals would be at greatest risk of being exposed if they were foraging through the area either immediately or within a few days after spraying occurred. Insects sought by black-backed woodpeckers reside under the bark and in the trunks of burned trees and are much less likely to be exposed because understory plants and weeds would be targeted, not burned trees.

The scenario representing the ingestion of contaminated fruit is a small bird or large bird consuming fruit that has been directly sprayed with chemical. The small bird used in this scenario weighs 0.1kg and the large bird weighs 4kg, neither of which is close to the weight of black-backed woodpeckers (0.07kg), thus I chose to show both scenarios which represent animals smaller and larger than the

species of concern. This species are considered bounded by these scenarios. It is assumed that black-backed woodpeckers would fall somewhere between the values for the birds in these scenarios.

Exposure to contaminated water is modeled to estimate glyphosate concentrations in water using a Gleams-Driver model. This model estimates peak and longer-term pesticide concentrations in surface water. HQs for birds are derived when modeled concentration rates are combined with the bird's weight and amount of water consumed. The small bird used in this scenario weighs 0.1kg and the large bird weighs 4kg, neither of which is close to the weight of black-backed woodpeckers (0.07kg), thus I chose to show both scenarios which represent animals smaller and larger than the species of concern. This species are considered bounded by these scenarios. It is assumed that black-backed woodpeckers would fall somewhere between the values for the birds in these scenarios.

Western bumblebee*:* There are no records of western bumble bee on the Stanislaus National Forest. Bumble bees forage, collecting nectar and pollen on many different flowering plants including; lupine, penstemon, asters, clovers, etc.

Reforestation: The areas proposed for herbicide treatments may provide suitable foraging, nesting, and overwintering habitat to bumble bees. It is likely that after the first year of treatment, understory vegetation would be much reduced in treated areas and would be unsuitable for foraging. There would be untreated areas within and adjacent to treated areas that would continue to provide suitable foraging habitat.

Weeds: Chemicals would be applied by targeting each plant, not broadcast spraying, so the number of non-targeted plants being sprayed would be minimal. The weeds would be sprayed prior to flowering, which reduces the potential for exposure to bees.

The likely types of exposure considered in this assessment for bumble bees would be the direct contact honeybee scenario and ingestion of contaminated vegetation.

The scenarios representing the ingestion of contaminated vegetation is an invertebrate consuming short grass or broadleaf vegetation that has been directly sprayed with chemical. This scenario is run for acute exposure, use residue rates, related to the amount of contaminated food eaten per day. The scenario for direct spray involves a honey bee that is directly sprayed with chemical and assumes complete absorption over the first day of exposure. This scenario is run for acute exposure only.

Glyphosate Analysis

Under Alternatives 1 and 5, up to about 31,000 acres are proposed for glyphosate treatments associated with reforestation (26,000 acres) and eradication of noxious weeds (5,000 acres). Treatment areas are spread across the entire project area. Under Alternative 4, up to 4,145 acres are proposed for glyphosate treatments in reforestation areas only. Glyphosate would be applied via backpack sprayer in a broadcast manner. Reference Table 3.16-3 for all scenarios and associated HQ values cited below.

Mammals**:** Toxicity values for mammals are based on an NOAEL of 500 mg a.e./kg/bw/day for acute and chronic exposure scenarios (SERA 2011). Decreases in food consumption and reduced body weight gain are commonly observed in mammals exposed to glyphosate (Ibid). However, most field studies provide no suggestion of adverse effects on mammalian populations or reproductive capacity, other than secondary effects which can be attributed to changes in vegetation (Ibid). All but one of the Hazard Quotients reported for proposed glyphosate application under Alternatives 1, 4, and 5 are below the NOAEL or No Observable Adverse Effect Level for the mammals considered herein. The upper limit for bats consuming contaminated insects is 1.0, which is just at the threshold of NOAEL.

Fisher and marten: For the scenario representing ingestion of a contaminated small mammal, a significant reduction in the risk of exposure is expected within a few days of the small mammal being sprayed. A small mammal, if sprayed, would be expected to immediately start grooming its fur, which

is a normal behavioral response when foreign objects are introduced to its fur. Once ingested by the small mammal through grooming its fur, the chemical would be quickly metabolized and excreted by the kidneys in the animal's waste products. Data from Brewster et al (1991) shows that after 28 hours, only .06% of an administered dose of 10 mg/kg bw remained in the blood of rats. (Cited *in* SERA 2007).

All of the associated upper level (worst case scenario) HQ values for acute and chronic/longer term exposure to glyphosate are well below 1, many are several orders of magnitude below the NOAEL threshold HQ value of one (1).

In summary, there is an extremely low potential for direct or indirect individual effects from the proposed application of glyphosate under Alternatives 1, 4, and 5 as described above. The proposed application of herbicides poses very limited toxicological risk to marten and fisher, especially considering they have not been documented in the project area. Because all HQs are well below the threshold of NOAEL or No Observable Adverse Effect Level, an adequate margin of safety in the unlikely or limited exposure of fisher or marten to contaminated prey, fruit, or water is provided.

Mule deer: Based on acute lethality data for glyphosate, there appear to be no remarkable differences in sensitivity among mammals; however, there is limited data that indicate larger mammals such as deer are somewhat more sensitive than smaller mammals to sub-lethal doses of glyphosate (SERA 2011).

It is possible that individual deer could forage on berries, leaves, or grasses that have been sprayed. The associated HQ values for non-accidental acute exposure at the upper limit (worst case scenario) for ingestion of contaminated broadleaf, tall, and short grass are 0.5, 0.4, and 0.9 respectively, approaching the threshold value of one (1) and warrants further discussion. The scenario for consumption of contaminated short grass (HQ = 0.9) is based on the large mammal eating 5 pounds of contaminated short grass per day. It is expected that the treated vegetation would quickly die becoming less desirable and the toxicity of the herbicide would result in taste aversion, resulting in reduced consumption of treated vegetation. It is unlikely that a deer would eat 5 pounds of contaminated short grass a day when untreated more palatable vegetation would be available near treated areas.

The associated HQ values for non-accidental acute and chronic/longer term exposure at the upper limit (worst case scenario) for a large mammal ingesting contaminated water are several orders of magnitude less than the threshold value of 1.

In summary, there is limited potential for direct or indirect individual effects from the proposed application of glyphosate under Alternatives 1, 4, and 5 as described above. The proposed application of herbicides poses some toxicological risk to deer because of the amount of area to be treated over multiple years. However, it is important to note that the exposure based on this risk assessment shows that all HQs are below the threshold of NOAEL or No Observable Adverse Effect Level; therefore, mule deer are provided an adequate margin of safety in the event that they are exposed to contaminated vegetation or water.

***Pallid, big-eared, and fringed myotis bats*:** The associated HQ values for non-accidental acute exposure at the upper limit (worst case scenario) for ingestion of contaminated insects is 1.0. This HQ value is at the threshold value of one (1) and warrants further discussion. This upper limit is based on the assumption that 100% of the insects being consumed have been contaminated and the amount of prey consumed accounts for about half of the body weight of the animal (0.02kg). The weight of the small mammal in this scenario a bit larger than the weight of a pallid bat, but 3 to 4 times that of the weight of fringed myotis and big-eared bats. Bats can eat up to their body weight in insects in a night. Bats tend to follow "foraging routes" and may target several foraging areas in one night or feeding bout; therefore, the likelihood that an individual would consume half its body weight in contaminated

insects at the spray location is low. It is more likely that they would receive a lesser exposure, perhaps better estimated by the central or lower limit exposure which has associated HQ values of 0.2 and 0.02 respectively, which are far below the threshold value of one (1). The duration for upper limit (worst case scenario) would last less than a few days in any one location. Insects would disperse from the immediate area naturally or as conditions such as the wind blew them elsewhere diluting the concentration of contaminated individuals available for consumption. The upper level model is an extremely conservative estimate based on the potential exposure of individual bats to contaminated insects and is at the threshold value of one (1) which indicates a slightly increased risk for toxic effects to individual bats.

The associated HQ values for non-accidental acute and chronic/longer term exposure at the upper limit (worst case scenario) for a small mammal ingesting contaminated water are several orders of magnitude less than the threshold value of 1.

In summary, there is a limited potential for direct or indirect individual effects from the proposed application of glyphosate under Alternatives 1, 4, and 5 as described above. The proposed application of herbicides poses some toxicological risk to bats because of the amount of area to be treated over multiple years. However, it is important to note that the exposure based on this risk assessment shows that all but one HQ are several orders of magnitude less than the NOAEL or No Observable Adverse Effect Level. The HQ value for ingestion of contaminated insects has an HQ value of 1, which just reaches the threshold. Therefore, these species are provided an adequate margin of safety in the event that they are exposed to contaminated prey or water.

***Birds*:** Toxicity values for birds are based on an NOAEL of 1500 or 58 mg a.e./kg/bw/day for acute and chronic exposure scenarios respectively (SERA2011). As with mammals, decreases in food consumption and reduced body weight gain are commonly observed in birds exposed to glyphosate (Ibid). While no specific studies have been conducted on birds, two studies involving the immersion of eggs in a solution of Roundup suggest that it is not likely to cause developmental effects in birds. No field studies report adverse effects in birds and effects on bird populations appear to be secondary effects which can be attributed to changes in vegetation (Ibid). All but one Hazard Quotient reported for proposed glyphosate application under Alternatives 1, 4, and 5 are below the NOAEL or No Observable Adverse Effect Level for the birds considered herein. There is one HQ that was 1.7 related to the scenario of black-backed woodpeckers exposed to contaminated fruit.

Bald eagle, great gray owl, goshawk & spotted owl: For the scenario representing ingestion of a contaminated small mammal, a significant reduction in the risk of exposure is expected within a few days of the small mammal being sprayed. A small mammal, if sprayed, would be expected to immediately start grooming its fur, which is a normal behavioral response when foreign objects are introduced to its fur. Once ingested by the small mammal through grooming its fur, the chemical would be quickly metabolized and excreted by the kidneys in the animals' waste products. Data from Brewster et al (1991) shows that after 28 hours, only .06% of an administered dose of 10 mg/kg bw remained in the blood of rats.

All of the associated upper level (worst case scenario) HQ values for acute and chronic/longer term exposure to glyphosate are several orders of magnitude below the NOAEL threshold value of one (1).

In summary, there is a limited potential for direct or indirect individual effects from the proposed application of glyphosate under Alternatives 1, 4, and 5 as described above. The proposed application of herbicides poses some toxicological risk to bald eagles, great gray owls, goshawks and spotted owls, because of the amount of area to be treated over multiple years. However, it is important to note that the toxicity exposure scenarios analyzed in the risk assessment show that all HQs are several orders of magnitude less than the NOAEL or No Observable Adverse Effect Level; therefore, these species are provided an adequate margin of safety in the event that they are exposed to contaminated prey or water.

Black-backed woodpecker: The associated HQ value for non-accidental acute exposure at the upper limit (worst case scenario) for ingestion of contaminated insects is 0.7. This HQ value is approaching the threshold value of one (1) and warrants further discussion. This upper limit is based on the assumption that 100% of the insects being consumed have been contaminated. Because the insects consumed by black-back woodpeckers are not typically associated with the target vegetation, it is highly unlikely that they would consume only contaminated insects. It is more likely that would receive a lesser exposure, perhaps better estimated by the central or lower limit exposure which has associated HQ values of 0.1 and 0.01 respectively, which are far below the threshold value of one (1).

The associated HQ values for non-accidental acute and chronic exposure at the upper limit (worst case scenario) for ingestion of contaminated fruit is 0.4 – 0.05 and 1.7 – 0.2. The HQ value for chronic exposure is greater than the threshold value of one (1) and warrants further discussion. Treatments would be applied during the early spring months before many plants have gone to fruit. It is expected that sprayed plants would be damaged or killed such that they wouldn't produce fruit after treatment. Additionally, there would be untreated areas that would provide foraging opportunities to individuals adjacent to and in treated areas. However, there is the potential for increased exposure of black-backed woodpeckers to toxic chemicals under this scenario.

The associated HQ values for non-accidental acute and chronic/longer term exposure at the upper limit (worst case scenario) for a small or large bird ingesting contaminated water are several orders of magnitude less than the threshold value of 1.

In summary, there is a moderate potential for direct or indirect individual effects from the proposed application of glyphosate under Alternatives 1, 4, and 5 as described above. The proposed application of glyphosate poses some toxicological risk to black-backed woodpeckers because of the amount of area to be treated over multiple years. However, it is important to note that the exposure based on the risk assessment shows that most HQs are less than NOAEL or No Observable Adverse Effect Level; therefore, these species are provided an adequate margin of safety in the event that they are exposed to contaminated prey, vegetation, or water. There is a slightly elevated risk associated with exposure to contaminated fruit.

Invertebrates: Toxicity values for insects are based on an NOAEL of 860 mg a.e./kg/bw/day for acute and chronic exposure scenarios respectively (SERA2011). Hazard Quotients reported for proposed glyphosate application under Alternatives 1, 4, and 5 indicate there is a toxicological risk for invertebrates.

Western bumble bee: A study of the application of very high water volumes and surfactant concentrations to honeybees found lethal effects, but this was suspected to have been the result of drowning rather than toxicity of surfactants (Bakke 2003). Regardless, insects are sensitive to physical impacts of liquids, including drowning. Palmer and Krueger (2001a *in* SERA 2001) report mortality of five percent (3/60) of honeybees directly sprayed with a dose of 100 µg/bee. This type of exposure corresponds to an HQ of 2.0. This dose is classified as an NOEC (No Observable Effect Concentration) because it was not significantly different from mortality in the matched solvent control (SERA 2011). It was significant when combining the matched solvent (0/60) with the negative control (0/60) to reach a control of (0/120). The direct contact honeybee acute exposure was not included because contact toxicity data, nectar residue data and oral toxicity data is not available for honeybees.

The associated HQ values for acute exposure at the upper limit (worst case scenario) for ingestion of contaminated short grass and broadleaf vegetation are 3.0 and 1.7 respectively, above the threshold value of one (1) and warrants further discussion. Vegetation would be treated in the early spring before the flowering period for most plants and are expected to die back within a week or two. Because the sprayed plants are not likely to provide suitable forage for bumble bees, they would

likely travel past treated areas in search of suitable forage. There would be untreated vegetation available within treatment units and near treated areas throughout implementation.

In summary, there is a moderate potential for direct or indirect toxicological effects to individuals from the proposed application of glyphosate under Alternatives 1, 4, and 5 as described above. The proposed application of herbicides poses toxicological risk to bumble bees because of the amount of area to be treated over multiple years.

Table 3.16-3. Summary of Hazard Quotients for Terrestrial Wildlife - Glyphosate

Summary of Hazard Quotients (Toxicity) for Terrestrial Wildlife-Glyphosate						
Application Rate:	**5**	**lb a.e./acre**				
Scenario	**Receptor**	**Hazard Quotients**			**Toxicity Value**	**Toxicity Endpoint**
		Central	**Lower**	**Upper**		
Non-Accidental Acute Exposures						
Contaminated Fruit [Lowest Residue Rates]	Larger Mammal (400g)	4E-02	5E-03	0.1	500	NOAEL
	Large Mammal (70 kg)	2E-02	3E-03	8E-02	500	NOAEL
	Small bird (10g)	1E-01	2E-02	4E-01	1500	NOAEL
	Large Bird (4 kg)	1E-02	2E-03	5E-02	1500	NOAEL
Contaminated Broadleaf Foliage	Large Mammal (70 kg)	1E-01	1E-02	0.5	500	NOAEL
	Insect	3E-01	5E-02	1.7	860	NOAEL
Contaminated Tall Grass	Large Mammal (70 kg)	8E-02	8E-03	0.4	500	NOAEL
Contaminated Short Grass [Highest Residue Rate]	Large Mammal (70 kg)	0.2	2E-02	0.9	500	NOAEL
	Insect	6E-01	1E-01	3.0	860	NOAEL
Contaminated Water	Small mammal (20g)	2E-05	2E-06	1E-04	500	NOAEL
	Canid (5 kg)	9E-06	1E-06	7E-05	500	NOAEL
	Large Mammal (70 kg)	7E-06	8E-07	5E-05	500	NOAEL
	Small bird (10g)	1E-05	1E-06	7E-05	1500	NOAEL
	Large Bird (4 kg)	1E-06	2E-07	1E-05	1500	NOAEL
Contaminated Insects	Small mammal (20g)	0.2	2E-02	1.0	500	NOAEL
	Small bird (10g)	0.1	1E-02	0.7	1500	NOAEL
Consumption of small mammal (after direct spray) by predator	Canid (5 kg)	3E-02	8E-03	5E-02	500	NOAEL
	Carnivorous bird (640 g)	1E-02	3E-03	2E-02	1500	NOAEL
Consumption of contaminated Fish	Fish-eating bird (2.4 kg)	9E-07	1E-08	4E-05	1500	NOAEL
Chronic/Longer Term Exposures						
Contaminated Fruit [Lowest Residue Rates]	Larger Mammal (400g)	6E-03	8E-04	2E-02	500	NOAEL
	Large Mammal (70 kg)	3E-03	5E-04	1E-02	500	NOAEL
	Small bird (10g)	5E-01	7E-02	1.7	58	NOAEL
	Large Bird (4 kg)	5E-02	7E-03	2E-01	58	NOAEL
Contaminated Broadleaf Foliage	Large Mammal (70 kg)	2E-02	2E-03	8E-02	500	NOAEL
Contaminated Tall Grass	Large Mammal (70 kg)	1E-02	1E-03	7E-02	500	NOAEL
Contaminated Short Grass [Highest Residue Rate]	Large Mammal (70 kg)	3E-02	3E-03	0.1	500	NOAEL

Contaminated Water	Small mammal (20g)	3E-07	1E-07	8E-06	500	NOAEL
	Canid (5 kg)	2E-07	7E-08	5E-06	500	NOAEL
	Large Mammal (70 kg)	1E-07	6E-08	4E-06	500	NOAEL
	Small bird (10g)	4E-06	2E-06	1E-04	58	NOAEL
	Large Bird (4 kg)	6E-07	3E-07	2E-05	58	NOAEL
Consumption of contaminated Fish	Fish-eating bird (2.4 kg)	4E-07	2E-08	7E-05	58	NOAEL

Clopyralid Analysis

Under Alternatives 1 and 5, about 705 acres are proposed for treatment of noxious weeds with clopyralid. Treatment areas, the location of the target weeds, are spread across an area of about 72,000 acres across the project area. Thistles, woolly mullein, spotted knapweed, and tocalote would be the targeted species sprayed with Clopyralid. Clopyralid would be applied by targeting each plant, not broadcast spraying, so the number of non-target plants being sprayed is assumed to be very few. Spraying would occur in the early to mid-spring before most if not all target weeds and surrounding vegetation were flowering. There is limited potential for terrestrial animal exposure throughout the project area. Reference Table 3.16-4 for all scenarios and associated HQ values cited below.

All Species: Toxicity values for mammals are based on an NOAEL of 75 or 15 mg a.e./kg/bw/day for acute and chronic exposure scenarios respectively (SERA 2004). Toxicity values for birds are based on an NOAEL of 670 or 15 mg a.e./kg/bw/day for acute and chronic exposure scenarios respectively (Ibid). No chronic toxicity studies in birds have been encountered so the chronic NOAEL for mammals is used in this assessment. Toxicity values for honey bees are based on an NOAEL of 909 mg/kg/bw.

While the plausibility of exposure is limited, all scenarios listed under the scenario section are considered here, except consumption of contaminated fish. No treatments are proposed in close proximity to Cherry Lake; therefore the scenario representing a bird eating a contaminated fish is not considered here.

There were no non-accidental acute exposure scenarios resulting in a Hazard Quotient that exceeds the designated NOAEL. In fact, all acute exposure HQs were several orders of magnitude below the threshold of 1. All but one chronic/longer term exposure scenario resulted in Hazard Quotients several orders of magnitude below the threshold of NOAEL or No Observable Adverse Effect Level. The scenario considered for black-backed woodpeckers as chronic exposure and ingestion of contaminated fruit by a small bird had an HQ of 1.1. The HQ value 1.1 is just above the threshold of concern, indicating the potential toxicological risk to individual woodpeckers. The small bird scenario represents a bird several times smaller than a black-backed woodpecker and thus is an extremely conservation assessment of potential risk. Additionally, because of the targeted spray application and the limited amount of acreage being sprayed across the landscape, it is unlikely that vegetation in close proximity to the weeds producing fruit eaten by woodpeckers would actually be sprayed.

In summary, there is limited potential for direct or indirect individual effects from the proposed application of clopyralid under Alternatives 1 and 5 as described above. The proposed application of clopyralid poses limited toxicological risk to terrestrial wildlife based on the limited area to be treated. It is also important to note that the exposure based on the risk assessment shows that all but one HQ is less than the NOAEL or No Observable Adverse Effect Level, most of them several orders of magnitude below the threshold of concern; therefore these species are provided an adequate margin of safety in the event that they are exposed to contaminated prey, vegetation, or water.

Table 3.16-4. Summary of Hazard Quotients for Terrestrial Wildlife - Clopyralid

Summary of Hazard Quotients (Toxicity) for Terrestrial Wildlife-Clopyralid						
Application Rate:	**0.25**	**lb a.e./acre**				
Scenario	**Receptor**	**Hazard Quotients**			**Toxicity Value**	**Toxicity Endpoint**
		Central	**Lower**	**Upper**		
Accidental Acute Exposures						
Direct Spray 100% absorption	Honey Bee	4E-02	4E-02	4E-02	909	NOEC
Non-Accidental Acute Exposures						
Contaminated Fruit [Lowest Residue Rates]	Larger Mammal (400g)	1E-03	2E-04	5E-03	75	NOAEL
	Large Mammal (70 kg)	7E-03	9E-04	3E-02	75	NOAEL
	Small bird (10g)	1E-02	2E-03	5E-02	670	NOAEL
	Large Bird (4 kg)	1E-03	2E-04	5E-03	670	NOAEL
Contaminated Broadleaf Foliage	Large Mammal (70 kg)	2E-01	2E-02	0.8	75	NOAEL
Contaminated Tall Grass	Large Mammal (70 kg)	3E-02	3E-03	0.1	75	NOAEL
Contaminated Short Grass [Highest Residue Rate]	Large Mammal (70 kg)	0.1	7E-03	0.3	75	NOAEL
Contaminated Water	Small mammal (20g)	1E-05	2E-06	3E-05	75	NOAEL
	Canid (5 kg)	6E-06	1E-06	2E-05	75	NOAEL
	Large Mammal (70 kg)	4E-06	1E-06	2E-05	75	NOAEL
	Small bird (10g)	2E-06	5E-07	7E-06	670	NOAEL
	Large Bird (4 kg)	3E-07	7E-08	1E-06	670	NOAEL
Contaminated Insects	Small mammal (20g)	0.1	6E-03	0.3	75	NOAEL
	Small bird (10g)	2E-02	2E-03	0.1	670	NOAEL
Consumption of small mammal (after direct spray)by predator	Canid (5 kg)	9E-03	3E-03	2E-02	75	NOAEL
	Carnivorous bird (640 g)	1E-03	4E-04	2E-03	670	NOAEL
Chronic/Longer Term Exposures						
Contaminated Fruit [Lowest Residue Rates]	Larger Mammal (400g)	2E-02	3E-03	1E-01	15	NOAEL
	Large Mammal (70 kg)	1E-02	2E-03	7E-02	15	NOAEL
	Small bird (10g)	2E-01	3E-02	1.1	15	NOAEL
	Large Bird (4 kg)	3E-02	3E-03	1E-01	15	NOAEL
Contaminated Broadleaf Foliage	Large Mammal (70 kg)	7E-02	5E-03	4E-01	15	NOAEL
Contaminated Tall Grass	Large Mammal (70 kg)	5E-02	4E-03	4E-01	15	NOAEL
Contaminated Short Grass [Highest Residue Rate]	Large Mammal (70 kg)	1E-01	1E-02	0.8	15	NOAEL
Contaminated Water	Small mammal (20g)	2E-05	2E-06	3E-05	15	NOAEL
	Canid (5 kg)	1E-05	1E-06	2E-05	15	NOAEL
	Large Mammal (70 kg)	8E-06	1E-06	1E-05	15	NOAEL
	Small bird (10g)	3E-05	4E-06	6E-05	15	NOAEL
	Large Bird (4 kg)	4E-06	6E-07	8E-06	15	NOAEL

Aminopyralid Analysis

Under Alternatives 1 and 5, about 546 acres are proposed for treatment of noxious weeds with aminopyralid. Treatment areas, the location of the target weeds, are spread across an area of about 30,000 acres within the project area. Thistles, spotted knapweed, oxeye daisy, sulfer cinquefoil, and tocalote would be the targeted species sprayed with aminopyralid. Aminopyralid would be applied by targeting each plant, not broadcast spraying, so the number of non-target plants being sprayed is assumed to be very few. Spraying would occur in the early to mid-spring before most if not all target weeds and surrounding vegetation were flowering. There is limited potential for terrestrial animal exposure throughout the project area. Reference Table 3.16-5 for all scenarios and associated HQ values cited below.

All Species: Toxicity values for mammals are based on an NOAEL of 104 or 50 mg a.e./kg/bw/day for acute and chronic exposure scenarios respectively (SERA 2007). Toxicity values for birds are based on an NOAEL of 14 or 184 mg a.e./kg/bw/day for acute and chronic exposure scenarios respectively (Ibid). For honeybees, no mortality would be expected following acute exposure to doses up to 1075 mg/kg based on direct spray studies and is considered a functional NOAEL (Ibid).

While the plausibility of exposure to wildlife is limited, all scenarios listed under the scenario section are considered here, except consumption of contaminated fish. No treatments are proposed in close proximity to Cherry Lake; therefore the bald scenario representing a bird eating a contaminated fish is not considered here.

There were no chronic/longer term exposure scenarios resulting in a Hazard Quotient that exceeds the designated NOAEL. In fact, all chronic HQs were several orders of magnitude below NOAEL. All but one non-accidental acute exposure scenario resulted in Hazard Quotients at or below NOAEL. The scenario considered for black-backed woodpeckers as non-accidental exposure and ingestion of contaminated insects by a small bird had an HQ of 1.8. The HQ value is slightly above the threshold of concern, indicating the potential for toxicological risk to individual woodpeckers. The small bird scenario represents a bird several times smaller than a black-backed woodpecker and thus is an extremely conservation assessment of potential risk. Additionally, because the insects black-backed woodpeckers prey upon are located under the bark of burned trees, it is unlikely that individuals would be exposed to aminopyralid at the level considered in this scenario.

In summary, there is a limited potential for direct or indirect individual effects from the proposed application of aminopyralid under Alternatives 1 and 5 as described above. The proposed application of aminopyralid poses limited toxicological risk to terrestrial wildlife based on the limited area to be treated. However, it is important to note that the exposure based on the risk assessment shows that all but one HQ are well below the threshold of concern or No Observable Adverse Effect Level, most of them several orders of magnitude below this threshold; therefore, these species are provided an adequate margin of safety in the event that they are exposed to contaminated prey, vegetation, or water.

Table 3.16-5. Summary of Hazard Quotients for Terrestrial Wildlife - Aminopyralid

Summary of Hazard Quotients (Toxicity) for Terrestrial Wildlife-Aminopyralid						
Application Rate:	**0.11**	**lb a.e./acre**				
Scenario	**Receptor**	**Hazard Quotients**			**Toxicity Value**	**Toxicity Endpoint**
		Central	**Lower**	**Upper**		
Accidental Acute Exposures						
Direct Spray 100% absorption	Honey Bee	2E-02	2E-02	2E-02	1075	NOEC
Non-Accidental Acute Exposures						
Contaminated Fruit [Lowest Residue Rates]	Larger Mammal (400g)	4E-03	5E-04	1E-02	104	NOAEL
	Large Mammal (70 kg)	2E-03	3E-04	8E-03	104	NOAEL
	Small bird (10g)	3E-01	4E-02	1.0	14	NOAEL
	Large Bird (4 kg)	3E-02	4E-03	1E-01	14	NOAEL
Contaminated Broadleaf Foliage	Large Mammal (70 kg)	1E-02	1E-03	0.1	104	NOAEL
Contaminated Tall Grass	Large Mammal (70 kg)	8E-03	8E-04	4E-02	104	NOAEL
Contaminated Short Grass [Highest Residue Rate]	Large Mammal (70 kg)	2E-02	2E-03	0.1	104	NOAEL
Contaminated Water	Small mammal (20g)	2E-05	3E-07	9E-05	104	NOAEL
	Canid (5 kg)	9E-06	2E-07	5E-05	104	NOAEL
	Large Mammal (70 kg)	7E-06	1E-07	4E-05	104	NOAEL
	Small bird (10g)	2E-04	4E-06	1E-03	14	NOAEL
	Large Bird (4 kg)	3E-05	6E-07	2E-04	14	NOAEL
Contaminated Insects	Small mammal (20g)	2E-02	2E-03	0.1	104	NOAEL
	Small bird (10g)	0.3	3E-02	1.8	14	NOAEL
Consumption of small mammal (after direct spray)by predator	Canid (5 kg)	3E-03	9E-04	5E-03	104	NOAEL
	Carnivorous bird (640 g)	3E-02	8E-03	4E-02	14	NOAEL
Chronic/Longer Term Exposures						
Contaminated Fruit [Lowest Residue Rates]	Larger Mammal (400g)	2E-03	2E-04	7E-03	50	NOAEL
	Large Mammal (70 kg)	1E-03	1E-04	4E-03	50	NOAEL
	Small bird (10g)	4E-03	5E-04	2E-02	184	NOAEL
	Large Bird (4 kg)	5E-04	5E-05	2E-03	184	NOAEL
Contaminated Broadleaf Foliage	Large Mammal (70 kg)	5E-03	4E-04	3E-02	50	NOAEL
Contaminated Tall Grass	Large Mammal (70 kg)	4E-03	3E-04	2E-02	50	NOAEL
Contaminated Short Grass [Highest Residue Rate]	Large Mammal (70 kg)	9E-03	7E-04	0.1	50	NOAEL
Contaminated Water	Small mammal (20g)	1E-05	3E-07	8E-05	50	NOAEL
	Canid (5 kg)	7E-06	2E-07	5E-05	50	NOAEL
	Large Mammal (70 kg)	6E-06	1E-07	4E-05	50	NOAEL
	Small bird (10g)	6E-06	2E-07	4E-05	184	NOAEL
	Large Bird (4 kg)	9E-07	2E-08	6E-06	184	NOAEL

Clethodim Analysis

Under Alternatives 1 and 5, about 3,100 acres are proposed for treatment of noxious weeds. Treatment areas, the location of the target weeds, are spread across an area of about 45,000 acres within the project area. Medusahead and barbed goatgrass would be the targeted species sprayed with clethodim. Two of the largest areas, comprising about 80 percent of the treatment proposed for medusahead are in critical winter deer range and near Ackerson meadow, an important area for great gray owls. Implementing these treatments would improve habitat conditions in the short and long-term for these and many other species. Reference Table 3.16-6 for all scenarios and associated HQ values cited below.

Clethodim would be applied by directed foliar spraying, not broadcast spraying. Spraying would occur in the early spring before the target weeds and most surrounding vegetation were flowering. There is potential for terrestrial animal exposure within the project area.

All Species: Toxicity values for mammals are based on an NOAEL of 100 or 19 mg a.e./kg/bw/day for acute and chronic exposure scenarios respectively (SERA 2014). Toxicity values for birds are based on an NOAEL of 950 or 20 mg a.e./kg/bw/day for acute and chronic exposure scenarios respectively (Ibid). For honeybees, a functional NOAEL is 860 mg/kg based on acute contact bioassays (Ibid).

While the plausibility of exposure to wildlife is limited, all scenarios listed under the scenario section are considered here, except consumption of contaminated fish. No treatments are proposed in close proximity to Cherry Lake; therefore the scenario representing a bird eating a contaminated fish is not considered here. No oral studies were available for honeybees; therefore, the scenario of invertebrates ingesting contaminated vegetation is not available for consideration in this analysis.

There were no chronic/longer term exposure scenarios resulting in a Hazard Quotient that exceeds the designated NOAEL. In fact, all upper level (worst case scenario) HQs were well below 1.0, most of them several orders of magnitude below the threshold of 1.

In summary, there is a limited potential for direct or indirect individual effects from the proposed application of clethodim under Alternatives 1 and 5 as described above. The proposed application of clethodim poses some toxicological risk to terrestrial wildlife based on the limited area to be treated. It is also important to note that the exposure based on the risk assessment shows that all HQs are less than the threshold of concern or the No Observable Adverse Effect Level, most of them several orders of magnitude below this threshold; therefore, these species are provided an adequate margin of safety in the event that they are exposed to contaminated prey, vegetation, or water.

Table 3.16-6. Summary of Hazard Quotients for Terrestrial Wildlife - Clethodim

Summary of Hazard Quotients (Toxicity) for Terrestrial Wildlife-Clethodim						
Application Rate:	**0.25**	**lb a.e./acre**				
Scenario	**Receptor**	**Hazard Quotients**			**Toxicity Value**	**Toxicity Endpoint**
		Central	**Lower**	**Upper**		
Accidental Acute Exposures						
Direct Spray 100% absorption	Honey Bee	5E-02	5E-02	5E-02	860	NOEC
Non-Accidental Acute Exposures						
Contaminated Fruit [Lowest Residue Rates]	Larger Mammal (400g)	9E-03	1E-03	3E-02	100	NOAEL
	Large Mammal (70 kg)	5E-03	7E-04	2E-02	100	NOAEL
	Small bird (10g)	9E-03	1E-03	3E-02	950	NOAEL
	Large Bird (4 kg)	1E-03	1E-04	4E-03	950	NOAEL
Contaminated Broadleaf Foliage	Large Mammal (70 kg)	2E-02	2E-03	0.1	100	NOAEL
Contaminated Tall Grass	Large Mammal (70 kg)	2E-02	2E-03	0.1	100	NOAEL
Contaminated Short Grass [Highest Residue Rate]	Large Mammal (70 kg)	5E-02	5E-03	0.2	100	NOAEL
Contaminated Water	Small mammal (20g)	1E-05	5E-09	2E-04	100	NOAEL
	Canid (5 kg)	6E-06	3E-09	1E-04	100	NOAEL
	Large Mammal (70 kg)	5E-06	2E-09	9E-05	100	NOAEL
	Small bird (10g)	2E-06	1E-09	4E-05	950	NOAEL
	Large Bird (4 kg)	3E-07	1E-10	5E-06	950	NOAEL
Contaminated Insects	Small mammal (20g)	5E-02	5E-03	0.2	100	NOAEL
	Small bird (10g)	1E-02	1E-03	6E-02	950	NOAEL
Consumption of small mammal (after direct spray)by predator	Canid (5 kg)	7E-03	2E-03	1E-02	100	NOAEL
	Carnivorous bird (640 g)	8E-04	3E-04	1E-03	950	NOAEL
Chronic/Longer Term Exposures						
Contaminated Fruit [Lowest Residue Rates]	Larger Mammal (400g)	4E-03	6E-04	2E-02	19	NOAEL
	Large Mammal (70 kg)	3E-03	3E-04	1E-02	19	NOAEL
	Small bird (10g)	4E-02	5E-03	0.2	20	NOAEL
	Large Bird (4 kg)	5E-03	6E-04	2E-02	20	NOAEL
Contaminated Broadleaf Foliage	Large Mammal (70 kg)	1E-02	1E-03	7E-02	19	NOAEL
Contaminated Tall Grass	Large Mammal (70 kg)	1E-02	9E-04	5E-02	19	NOAEL
Contaminated Short Grass [Highest Residue Rate]	Large Mammal (70 kg)	2E-02	2E-03	0.1	19	NOAEL
Contaminated Water	Small mammal (20g)	2E-05	1E-08	6E-04	19	NOAEL
	Canid (5 kg)	3E-04	1E-07	6E-03	1	NOAEL
	Large Mammal (70 kg)	1E-05	4E-09	3E-04	19	NOAEL
	Small bird (10g)	4E-05	2E-08	1E-03	20	NOAEL
	Large Bird (4 kg)	6E-06	2E-09	1E-04	20	NOAEL

Valley Elderberry Longhorn Beetle: Affected Environment

Species and Habitat Account

The valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*) is listed as Threatened under the Endangered Species Act. No Designated Critical Habitat is identified on the Stanislaus National Forest. The valley elderberry beetle (VELB) is thought to range from the Central Valley into the eastern portion of the Coast Range and the foothills of the Sierra Nevada up to approximately 3,000 feet (USFWS 1999).

This species is most often found along the margins of rivers and streams in the lower Sacramento River and upper San Joaquin Valley. The current known range of the VELB extends from southern Shasta County south to Fresno County (Barr 1991).

Habitat for the VELB consists of elderberry shrubs and trees in a variety of habitats and plant communities, but most often in riparian, elderberry savannah or moist valley oak woodlands. Common associated plants include *Populus spp., Salix spp., Fraxinus spp., Quercus spp., Juglans spp., Acer negundo, Rubus spp., Toxicodendron diversiloba, Vitis californica, Rosa spp., and Baccharis spp*. (USFWS 2006a). VELB appear to favor sites with high elderberry densities and are limited in their ability to disperse and colonization of new sites (Collinge et al. 2001).

Valley elderberry longhorn beetles have not been observed or documented on the Stanislaus National Forest; however, presence is assumed where elderberry plants with stems greater than 1 inch at the base are found. Most elderberry plants damaged by fire have resprouted and some have actually grown so quickly they are of adequate size to host elderberry beetles (Baumbach pers. obs.). All proposed treatment units at or below 3,000' have been surveyed. Three elderberry shrubs were found in one proposed reforestation unit (Z030). All three plants are resprouts from plants burned at high severity in the Rim Fire and no exits holes were found. The nearest documented VELB occurrence was one beetle on an elderberry shrub almost 24 miles to the west of the fire near Jamestown in 2002.

Eggs are laid in late spring on elderberry stems greater than 1 inch in diameter, as measured at the base, on healthy and unstressed plants. Larvae excavate passages into the elderberry shrub where they may remain in larval form for as long as two years before they emerge as adults. Exit holes are usually on stems greater than 0.5 inches in diameter, with 70 percent of the exit holes at heights of 4 feet or greater; these holes are circular to slightly oval, with a diameter of 7 to 10 mm (Barr 1991).

VELB has been found only in association with its host plant, elderberry. Adults feed on the foliage and perhaps flowers of elderberry plants, and are present from March through early June (Barr 1991).

There are about 25,413 acres of potential habitat area below 3,000' elevation within the analysis area. There are about 25,517 acres of potential habitat area within the cumulative analysis area. This is mainly in the river canyons where treatments are not proposed.

Risk Factors identified for VELB include:

1. Loss or alteration of habitat- The primary threat to survival of VELB is the loss or alteration of habitat. Stream development and urbanization have resulted in the removal of significant amounts of suitable habitat. On National Forest System lands, cattle grazing has heavily damaged elderberry in some areas and may reduce the quantity and quality of available habitat.
2. Pesticides& Herbicides- Individual beetles, localized beetle populations, and plants are subject to injury or loss from pesticide applications. Pesticides pose a risk to the VELB and its host plant. Some chemicals from the valley are known to drift upslope and into the Sierra on prevailing wind currents (McConnell et al. 1998, Bradford et al. 2010). Smaller amounts of pesticides and herbicides are used in the local area by the Forest Service to control shrubs and noxious weeds, and lesser amounts are used by surrounding local landowners.

3. Predation- Predation by birds, other insects, and small mammals may have negative effects on localized populations.
4. Argentine Ant- The widely established non-native Argentine ant (*Linepithema humile*) also poses a threat to VELB. While Argentine ants are common in the core valley habitat of the VELB, it does not appear to be widely established in the Sierra foothills, likely due to summer drought or winter cold.

Management Direction

Conservation Guidelines for VELB are provided in USFWS (1999). The valley elderberry longhorn beetle is listed as Threatened under the ESA. While there is no Designated Critical Habitat on the Stanislaus National Forest, habitat exists and so there is the potential for the beetle to occur on the forest. The following management requirements would mitigate adverse effects to this species under the proposed action and are consistent with the VELB Conservation Measures (USFWS 1999):

- Flag and avoid elderberry plants greater than one inch stem diameter that occur below 3,000 feet elevation and within treatment units (units Z030).
- Within 10 feet of elderberry plants, prohibit ground based mechanical operations, burning, and herbicide application.
- Pile and broadcast prescribed burning, mechanical activities, and herbicide application in unit Z030 and within 100 feet of flagged shrubs would be subject to an LOP from April 1 through June 30 to prevent smoke, dust, and herbicide impacts to beetles.
- If additional elderberry shrubs with stems over 1inch diameter are found prior to or during project implementation, they would be similarly avoided and the District wildlife biologist would be notified immediately and adequate mitigation measures would be taken.

Valley Elderberry Longhorn Beetle: Environmental Consequences

The project action alternatives could result in direct and indirect effects to the VELB through the following activities:

- Site prep for planting conifers (e.g., dozer piling or herbicide application).
- Broadcast prescribed fire or pile burning.

These activities may have direct and indirect effects on VELB through the following:

- Project related death, injury, or disturbance.
- Project related modifications to habitat quality.

Death, injury, and disturbance

Death or injury of larvae and elderberry shrubs from project related mechanical activities would be unlikely to occur given the mechanical activity buffers around elderberry plants and Limited Operating Periods (LOPs) which would eliminate the potential for dust and smoke impacts. Death or injury from herbicide application would be unlikely to occur given the prohibition of spraying elderberry shrubs and the 100 foot buffer protecting each shrub. Larvae and the elderberry plants would be protected by these buffers. Prescribed burning operations in unit Z030 has the potential to burn individual plants; however, vegetation around existing plants would be pulled back so the risk of burning individual plants is considered extremely low.

Project related modifications to habitat quality

No modification of habitat quality is expected from mechanical or pile burning operations because all identified elderberry plants with stems greater than one inch in diameter would have a buffer prohibiting mechanical activities within ten feet of shrubs. There is a very low risk of the loss of individual shrubs during prescribed fire operations because vegetation surrounding individual shrubs would be pulled away from the shrubs.

Indicators

The following indicators were chosen to provide a relative measure of the direct and indirect effects to the VELB and to determine how well project alternatives comply with the species' conservation strategy.

1. Disturbance potential
2. Habitat alteration potential
3. Toxicological effects from herbicide use

Alternatives 1, 3, and 5

Because the reforestation treatment areas proposed under Alternatives 1, 3, and 5 are the same, the effects for indicators 1 and 2 are expected to be the same and are therefore analyzed together.

DIRECT AND INDIRECT EFFECTS

There are three elderberry shrubs within proposed treatment unit Z030. Contractors would be briefed on the need to avoid damaging the elderberry plants and the possible penalties for not complying with these requirements. All crews working in the area would be instructed on the status of the beetle and the need to protect its elderberry host plant.

Indicator 1. Because virtually all of the VELB lifecycle is spent on elderberry shrubs, either inside the stems as larvae or on the foliage or flowers as adults, the greatest risk to individuals would come from activities in the immediate vicinity of elderberry plants.

Buffers applied to individual plants where no mechanical activity would occur and LOPs in place during the adult flight period restricting mechanical activities and pile burning would eliminate almost all risk to individuals associated with implementation of the action alternatives.

Buffers applied prohibiting herbicide application within 100 feet of elderberry shrubs would provide protection to plants and individual larvae and beetles. Because elderberry beetles are found only in association with elderberry plants, there is an extremely low risk of beetles coming in contact with herbicides on other species of plant.

Therefore, the potential for death or injury of individual plants, larvae, or adult beetles given the mitigation measures in place is either insignificant (i.e., cannot be meaningfully measured, detected, or evaluated) or discountable (i.e., extremely unlikely to occur).

Indicator 2. Similar to indicator 1, buffers applied to individual shrubs would eliminate almost all risk of habitat alteration and effects to individual elderberry shrubs. Additionally, pulling back vegetation away from individual shrubs would eliminate almost all risk to shrubs from prescribed fire operations.

Operating heavy equipment may result in excess deposition of dust and other particulate matter on individual plants; however, a study of proximity to roads and dust impacts to elderberry plants found no evidence of negative effects (Talley et al. 2006).

Based on the above analysis and the fact that no elderberry beetles have been documented in the project area or the forest, the potential for disturbance or habitat alteration with respect to VELB is either insignificant (i.e., cannot be meaningfully measured, detected, or evaluated) or discountable (i.e., extremely unlikely to occur).

CUMULATIVE EFFECTS

The Forest queried its databases, including the Schedule of Proposed Actions (SOPA) to determine present and reasonably foreseeable future actions as well as present and reasonably foreseeable future actions on other public (non-Forest Service) and private lands (Appendix B, Rim Reforestation EIS). Some, but not all of these actions have or may contribute cumulatively to effects on VELB.

Risk factors potentially affecting VELB have been identified and include habitat loss and alteration through development, use of pesticides and herbicides, and grazing. Habitat modification was used as a relative measure of cumulative effects of the action alternatives.

The potential habitat area below 3,000' elevation is almost entirely within the Tuolumne River Canyon and its tributaries, and a small portion of Grapevine Creek, which is managed by the Forest Service and the Bureau of Land Management. Much of the Tuolumne River aside from the Hetch-Hetchy facilities are designated and managed as Wild and Scenic.

Habitat Modification

Federal Lands: The Rim Hazard Tree Removal project and the Rim Recovery project are the only two present actions on public lands within the potential habitat area. The actions presently underway include about 152 acres of tractor or hand piling and burning associated with the Rim Recovery project and about 827 acres of tractor piling associated with the Hazard Tree Removal project. These projects are not likely to affect habitat suitability for VELB because management requirements approved by USFWS are in place and would protect elderberry plants and the valley elderberry longhorn beetle.

Livestock grazing is both a present and foreseeable future action on federal lands within the potential habitat area. Cattle grazing has heavily damaged elderberry in some areas and may reduce the quantity and quality of available habitat across about 12,126 acres within the analysis area.

Private Lands: The cumulative effects analysis area contains private timberland, residential areas, and rangeland below 3,000' elevation where elderberry plants and beetles may occur. Some of the private inholdings include meadows and associated riparian habitat that may support elderberry shrubs. There are also power plants, dams, powerlines, and other facilities associated with Hetch-Hetchy in the Tuolumne River Canyon and Cherry Creek within the elevation range of VELB. Some of this infrastructure intersects with National Forest System lands and is under special use permits.

There are 7 acres of National Forest System lands with a future special use permit proposed for vegetation treatments associated with the Reliable Power Project. About two acres of shredding or mastication and 5 acres of chemical application to control vegetation under powerlines have been proposed. Reliable Power would establish an agreement, if one is not already in place, with USFWS regarding VELB and their habitat and are expected to adhere to those requirements as part of their special use permit.

No other present or foreseeable future actions are proposed on private lands within the potential habitat area.

Alternatives 1, 3, and 5 Contribution/Summary: Because the Rim Reforestation project is not expected to result in any measurable effects to VELB, it is not expected to contribute to cumulative effects.

Alternatives 1 and 5

DIRECT AND INDIRECT EFFECTS

Indicator 3. Under Alternatives 1 and 5, herbicide use is expected to have no toxicological effects upon VELB because we would employ a buffer of 100 feet around all three elderberry shrubs in unit Z030 prohibiting herbicide application.

CUMULATIVE EFFECTS

Because the Rim Reforestation project is not expected to result in any measurable effects to VELB, it is not expected to contribute to cumulative effects.

Alternative 2

DIRECT AND INDIRECT EFFECTS

Under No Action, death, injury or disturbance would not be an issue because no active management would occur.

The indirect effects of Alternative 2 are primarily related to the influence no action may have on future wildfires and how future wildfires may impact VELB habitat.

Indicator 1. Because no management activities would occur under this alternative, there would be no project related direct effects to individual valley elderberry longhorn beetles or larvae or elderberry shrubs.

Indicator 2. Within the areas that burned at high severity, elderberry shrubs and other herbaceous and shrub vegetation have become somewhat reestablished over the past two years post-fire. This vegetation is expected to continue to reestablish themselves over the next two to three years. Elderberry shrubs that are of appropriate size for beetle and larvae occupancy can provide suitable habitat for VELB. These benefits are expected in the short-term (10-20 years). Elderberry shrubs are expected to be vulnerable to loss in a future wildfire; but these plants are expected to resprout vigorously as they have done after previous fire events.

Indicator 3. Because no herbicides are proposed under this alternative, there would be no exposure to herbicides and no direct, indirect, or cumulative toxicological effects under this alternative.

CUMULATIVE EFFECTS

The cumulative effects analysis discussion under Alternatives 1, 3, and 5 outlines those present and foreseeable future activities scheduled on public and private lands considered under this alternative.

Alternative 2 Contribution/Summary: The cumulative contribution of Alternative 2 is attributed to the influence no action may have on how future wildfires may adversely impact elderberry habitat. Elderberry shrubs are expected to be vulnerable to loss in a future wildfire; but these plants are expected to resprout vigorously as they have done after previous fire events.

Alternative 3

Indicator 3. Because no herbicides are proposed under this alternative, there would be no exposure to herbicides and no direct, indirect, or cumulative toxicological effects to VELB under this alternative.

Alternative 4

No management activities are proposed where elderberry shrubs occur; therefore, direct, indirect, and cumulative effects are expected to be the same as those described under the No Action alternative.

Valley Elderberry Longhorn Beetle: Summary of Effects

Alternatives 1, 3, and 5 would be unlikely to have any adverse direct or indirect effects to the VELB.

All elderberry plants capable of supporting VELB would be flagged and avoided. LOPs or buffers would be in place under Alternatives 1, 3, and 5 to eliminate negative impacts from dust, smoke, or herbicides. Since there would be no management activities under Alternative 4, effects are expected to be the same as under the No Action alternative.

Determination of Effects

Implementing the Rim Reforestation Project Alternatives 1, 3, or 5 has very little potential to impact individual valley elderberry longhorn beetles and the elderberry habitat required by the species. The surveys and buffers established around individual plants and project management requirements would greatly reduce the potential risk associated with potential direct and indirect effects to individual

VELB or associated elderberry plants. The project does not occur within Designated Critical Habitat for the species and would have no effect on critical habitat; however, the primary constituent elements occur within and adjacent to the project area indicating suitable habitat is present. Therefore, the following determinations are supported by the analysis contained herein. Specifically, the potential for effects to VELB from implementation of the alternatives are either discountable (i.e. extremely unlikely to occur) or insignificant (i.e. cannot be meaningfully measured, detected, or evaluated).

ALTERNATIVES 1 AND 5

It is my determination that Alternatives 1 and 5 may affect but are not likely to adversely affect the valley elderberry longhorn beetle.

It is my determination that Alternatives 1 and 5 will not affect Designated Critical Habitat for the valley elderberry longhorn beetle.

My determination is based on the following rationale:

- The valley elderberry longhorn beetle has never been documented to occur on the Stanislaus National Forest. (Discountable effect)
- All elderberry plants greater than one inch stem diameter would be flagged and avoided where they occur (unit Z030). (Discountable effect)
- Any ground based mechanical equipment operations, or burning within 10 feet of elderberry plants would be prohibited. (Discountable effect)
- Herbicide application within 100 of elderberry shrubs with stems greater than 1 inch dbh is prohibited.
- Pile and broadcast prescribed burning, and mechanical activities within 100 feet of flagged shrubs would be subject to an LOP from April 1 through June 30 to prevent smoke or dust impacts to beetles. (Discountable effect)

ALTERNATIVES 2 AND 4

It is my determination that Alternatives 2 and 4 may affect but are not likely to adversely affect the valley elderberry longhorn beetle.

It is my determination that Alternatives 2 and 4 will not affect Designated Critical Habitat for the valley elderberry longhorn beetle.

My determination is based on the following rationale:

- The valley elderberry longhorn beetle has never been documented to occur on the Stanislaus National Forest.
- There is potential for loss of habitat or individuals in a future fire (natural or human caused).

ALTERNATIVE 3

It is my determination that Alternative 3 may affect but is not likely to adversely affect the valley elderberry longhorn beetle.

It is my determination that Alternative 3 will not affect Designated Critical Habitat for the valley elderberry longhorn beetle.

My determination is based on the following rationale:

- The valley elderberry longhorn beetle has never been documented to occur on the Stanislaus National Forest. (Discountable effect)

- All elderberry plants greater than one inch stem diameter would be flagged and avoided where they occur (unit Z030). (Discountable effect)

- Any ground based mechanical equipment operations and burning within 10 feet of elderberry plants would be prohibited. (Discountable effect)

- Pile and broadcast prescribed burning, and mechanical activities within 100 feet of flagged shrubs would be subject to an LOP from April 1 through June 30 to prevent smoke or dust impacts to beetles. (Discountable effect)

Further rationale for determinations:

Guidance provided in the Endangered Species Consultation Handbook (USFWS and NMFS 1998, page 3-12) indicates that "MAY AFFECT BUT IS NOT LIKELY TO ADVERSELY AFFECT" is the appropriate conclusion when effects on listed species are expected to be discountable, or insignificant, or completely beneficial. Discountable effects are those that are extremely unlikely to occur. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Beneficial effects are positive effects without adverse effects to the species.

Valley Elderberry Longhorn Beetle: Compliance

On August 8, 1980, VELB was listed as a Threatened species (45 FR 52803). Critical Habitat was also designated at this time, but does not occur on the Stanislaus National Forest. The action alternatives would not affect the recovery plan objectives for the VELB. The recovery plan objectives for VELB are to minimize further degradation, development, or environmental modification of VELB habitat, and to delist the VELB (USFWS 1984).

VELB Conservation Strategy Guidelines

The United States Department of the Interior, Fish and Wildlife Service issued Conservation Guidelines (USFWS 1999) to assist Federal agencies, during project planning, to avoid or minimize adverse effects on the valley elderberry longhorn beetle. The following guidelines and previous consultation recommendations from the Service were used when developing management requirements the Rim Reforestation project:

- Flag all areas to be avoided during reforestation activities.
- Apply a limited operating period from April 1 through June 30 prohibiting pile and prescribed broadcast burning, and mechanical activities within 100 feet of elderberry plants to prevent smoke and dust impacts to beetles.

Management Requirement Compliance

The following management requirements are consistent with VELB Conservation Guidelines and apply to all action alternatives considered for the Rim Reforestation Project:

1. Flag and avoid elderberry plants where they occur (unit Z030).
2. Within 10 feet of elderberry plants, prohibit ground based mechanical operations or burning.
3. Pile and prescribed broadcast burning and mechanical activities within 100' of flagged shrubs would be subject to an LOP from April 1 through June 30 to prevent smoke and dust impacts to beetles.
4. If additional elderberry shrubs with stems over 1" diameter are found prior to or during project implementation, they would be similarly avoided and the District wildlife biologist would be notified immediately and adequate mitigation measures would be taken.

The following management requirements are consistent with VELB Conservation Guidelines and apply to Alternatives 1and 5 considered for the Rim Reforestation Project:

1. Herbicide application is prohibited within 100 feet of elderberry plants with stems greater than one inch in diameter.

Bald Eagle: Affected Environment

Species and Habitat Account

The bald eagle (*Haliaeetus leucocephalus*) is a Region 5 Forest Service Sensitive species. The bald eagle breeds primarily in specific and localized large rivers and lakes of the northern third of California, with scattered nesting throughout the state.

Bald eagles typically nest in live trees, some with dead tops, and build a large (~1.8 m/6 ft diameter), generally flat-topped and cone-shaped nest usually below the top with some cover above the nest (Jackman and Jenkins 2004). In general, bald eagles require a large tree to accommodate a large nest in a relatively secluded location within the range of their tolerance of human disturbance (Ibid). Diurnal perch habitat is characterized by the presence of tall, easily accessible; often dominant trees adjacent to shoreline foraging habitat (Buehler 2000). The entire breeding cycle, from initial activity at a nest through the period of fledgling dependency, is about 8 months (Ibid).

The project is within the current distribution of bald eagles in California. There is one bald eagle nest in the project area and is located at Cherry Lake. This site has been occupied for more than 16 years. Although nest trees have changed over this period, the nest site has consistently been in the same general stand on the Cherry Lake shoreline. The post-fire condition of the nest, nest tree, and nest stand all appear intact and suitable (Baumbach, pers.obs.). After over 16 years of being occupied as a bald eagle territory, it appears the carrying capacity of Cherry Lake is limited to one pair of breeding bald eagles. Bald eagles also use the Cherry Lake area during migration and for overwintering (NRIS Wildlife database). No treatments are proposed within one half mile of this nest site; therefore, an LOP for this species is not required. The nearest unit is about one mile south of the current nest site.

Risk Factors

USDA (2001) summarized risk factors potentially influencing bald eagle abundance and distribution:

1. Nest site loss and disturbance
2. Loss of habitat and habitat components such as potential nest or roost trees.

Management Direction

Current management direction for bald eagle is to follow all law, regulation, and policy as it relates to bald eagle because the species is still vulnerable to potential disturbance impacts and is still within the delisting monitoring period (R5 Sensitive species evaluation form of 2012). Forest Plan Direction (2010) p.43 states: When nesting bald eagles are found, implement suitable restrictions on nearby activities based on the Regional habitat management guidelines and the habitat capability model for the species. Protect all historic and active nests, as required by the Eagle Protection Act and the Migratory Bird Treaty Act.

The Eagle Protection Act (16 U.S.C. 668-668c), enacted in 1940, and amended several times since then, prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. The Act provides criminal and civil penalties for persons who disturb nest sites by substantially interfering with normal breeding, feeding, or sheltering behavior (USFWS 2007).

The Migratory Bird Treaty Act (MBTA), 16 U.S.C. 703-712, prohibits the taking of any migratory bird or any part, nest, or egg, except as permitted by regulation. The MBTA was enacted in 1918; a 1972 agreement supplementing one of the bilateral treaties underlying the MBTA had the effect of expanding the scope of the Act to cover bald eagles and other raptors.

Habitat management guidelines to follow for bald eagle are provided by the National Bald Eagle Management Guidelines (USFWS 2007).

Bald Eagle: Environmental Consequences

The project alternatives could result in direct and indirect effects to the bald eagle through the following activities:

- Mechanical site prep for planting.
- Herbicide application for site prep and release of conifers.
- Planting conifers.

These actions may have direct and indirect effects on bald eagles through the following:

- Project related death, injury, or disturbance.
- Project related modifications to habitat quantity and/or quality.

Death, injury and disturbance

Death, injury, and disturbance are potential direct effects to consider for bald eagle (USDA 2004). Disturbance issues are expected to be most pronounced within ½ mile of nests (USFWS 2007). There are no activities proposed within one half mile of the known nest site at Cherry Lake. Therefore, the risk of death, injury, or disturbance from project activities is extremely low. Human presence related to proposed activities more than one mile from the nest site is not likely to change normal behavior or impair essential behavior patterns of the bald eagle related to breeding, feeding, or sheltering. While herbicide application in new plantations is unlikely to affect bald eagles directly, small mammals and birds eaten by eagles have the potential to be exposed to herbicides and therefore could result in bald eagle exposure if consuming exposed prey. This scenario is considered highly unlikely and the risk extremely low.

Habitat modification

Planting conifers is proposed within 500 feet of Cherry Lake which is within an area bald eagles could use to nest and forage. Bald eagles focus nesting, roosting, and perching behaviors along shorelines and habitat modification effects are expected to be most pronounced within 500 feet of lake shorelines (Jackman and Jenkins 2004). Bald eagles will roost and perch in relatively small trees, while the average nest tree size documented in California used by bald eagles is 43 inches dbh and 131 feet tall (Lehman 1979).

Indicators

The following indicators were chosen to provide a relative measure of the direct and indirect effects to the bald eagle and to determine how well project alternatives comply with Forest Plan Direction.

1. Treatments within 500 feet of lake shorelines.
2. Toxicological effects from herbicide use.

This criterion was chosen based on the best available scientific literature which focuses on various aspects of bald eagle ecology and life history requirements. This criterion focuses on the life history aspects, or habitat elements, considered most limiting to bald eagle persistence across their range and where project effects are expected.

Alternatives 1, 3, and 5

Because there is no difference in areas proposed for reforestation or thinning, under these three alternatives, the effects are expected to be similar and are analyzed together. The differences in herbicides proposed between Alternatives 1 and 5 versus Alternative 3 were separated below accordingly.

DIRECT AND INDIRECT EFFECTS

Indicator 1. Only a small portion of one reforestation unit (24 acres) occurs within 500 feet of Cherry Lake. In the short-term, up to 20 years, the planted area would provide little benefit to eagles because the trees would be of small size and would not contribute to roosting or perching habitat. In the long-term, benefits to eagles include additional perch and roost sites adjacent to the shoreline. It is unlikely that trees would grow to a sufficient size to be used as nesting trees until well beyond 50 years. There are several existing plantation units near Cherry Lake proposed for thinning and the removal of dead material, pockets of mortality from the Rim Fire. Thinning these plantations is expected to result in accelerated growth rates in remaining trees, providing additional nest, perch and roosting trees sooner than without treatments. Additionally, removal of dead material would result in reduced fuel loading. The combination of treatments is expected to improve the resiliency of these stands when fire returns to this landscape.

Indicator 2. Under Alternatives 1 and 5, herbicide use is expected to have a limited potential for direct or indirect toxicological effects on bald eagles as described under the herbicide risk assessment section. Because no herbicides are proposed under Alternative 3, there would be no exposure to herbicides and no direct, indirect, or cumulative toxicological effects to bald eagles under this alternative.

CUMULATIVE EFFECTS

The Forest queried its databases, including the Schedule of Proposed Actions (SOPA) to determine present and reasonably foreseeable future actions as well as present and reasonably foreseeable future actions on other public (non-Forest Service) and private lands (Appendix B, Rim Reforestation EIS). Some, but not all of these actions have or may contribute cumulatively to effects on bald eagles.

Risk factors potentially affecting bald eagle abundance and distribution have been identified and include nest site loss and disturbance, and loss of habitat and habitat elements such as potential nest or roost trees. Exposure to herbicides and potential toxicological effects associated with exposure were also identified as having the potential to affect bald eagles. The following relevant evaluation criteria were used as relative measures of cumulative effects from this alternative to eagles: disturbance, nest and roost site availability, and toxicological effects.

Disturbance

Federal Lands: Recreational use adjacent to Cherry Lake is the only present and foreseeable action on Federal Lands. Recreational use of Cherry Lake is limited to existing and mostly quiet uses in this area (i.e. primarily trailhead parking and hiking). Based on continued nesting by the bald eagles at this location, these recreation activities do not affect bald eagle behavior.

Private Lands: There are no private land activities within one half mile of the known nest site or within 500 feet of Cherry Lake.

Nest and Roost Site Availability

No present or foreseeable future federal or private activities are proposed in close proximity to Cherry Lake that would affect the availability of nest and roost sites for bald eagles.

Toxicological effects

Federal lands: There is one present federal action of herbicide use on 0.5 acres under the Rim Fire Rehabilitation project and two foreseeable federal actions of herbicide use: 8 acres under the Twomile Ecological Restoration Noxious Weed project and 23 acres associated with a special use permit for the Reliable Power Project to control vegetation under powerlines. There are no other present or foreseeable future federal actions related to herbicide use.

Private lands: Herbicide use is proposed on 1,583 acres of private land within the project area in 2017. No other present or foreseeable future actions are proposed on private lands related to herbicide application.

Alternatives 1, 3, and 5 Contribution/Summary: The limited scope and duration of treatments under these alternatives is not expected to cumulatively contribute to disturbance effects to bald eagles. Planting conifers adjacent to Cherry Lake would provide potential nest, perch, and roost sites for bald eagles in the long-term. Thinning plantations and removing dead material would result in faster growth rates of remaining trees and increasing the resiliency of these stands, reducing the risk of loss when fire returns to this area. There is limited potential for toxicological effects from herbicide use to bald eagles under Alternatives 1 and 5. The cumulative contribution of these alternatives on bald eagles is considered minor and is not expected to affect the viability of this species.

Alternative 2

DIRECT AND INDIRECT EFFECTS

Under No Action, death, injury or disturbance would not be an issue because no active management would occur.

Indicator 1. The indirect effects of no action are primarily related to the influence no action may have on the amount and location of suitable forested habitat available to bald eagles adjacent to Cherry Lake. Under Alternative 2, no management activities would occur within 500 feet of Cherry Lake. The only tree expansion into this area could occur as a result of natural regeneration. Because no active management would occur, it is unknown where naturally regenerating forest would occur. It is likely that areas in close proximity to live trees (i.e. seed source) would experience forest expansion to a limited degree. If plantations near Cherry Lake are not treated, thinning green trees and removal of dead material, these stands may be at increased risk of loss when fire returns to the landscape, which would negatively affect bald eagles in the area.

Indicator 2. Because no herbicides are proposed under this alternative, there would be no exposure to herbicides and no direct, indirect, or cumulative toxicological effects to bald eagles under this alternative.

CUMULATIVE EFFECTS

The cumulative effects discussion under Alternatives 1, 3, and 5 outlines those present and foreseeable future activities scheduled on public and private lands.

Alternative 2 Contribution/Summary: Alternative 2 is not expected to contribute to direct, indirect, or cumulative effects related to disturbance. There may be indirect consequences under this alternative primarily related to the influence no action may have on forest development and plantation resiliency adjacent to Cherry Lake and how that may impact bald eagles. It is unknown how much and when natural forest recovery would occur adjacent to Cherry Lake, which could delay the availability of nest, perch, and roost sites in the area. The green plantations adjacent to Cherry Lake may be at greater risk of loss when fire returns. Alternative 2 cumulative contributions to effects on bald eagles are considered minor and are not expected to affect the viability of this species.

Alternative 4

DIRECT AND INDIRECT EFFECTS

Indicator 1. Under Alternative 4, no reforestation is proposed within 500 feet of Cherry Lake. There are plantation units near Cherry Lake that are proposed for treatments under this alternative. The prescriptions and effects are expected to be the same as described under Alternatives 1, 3, and 5.

Indicator 2. The herbicide use proposed under Alternative 4 is expected to have a limited potential for direct or indirect toxicological effects on bald eagles as described under the herbicide risk assessment section.

CUMULATIVE EFFECTS

The cumulative effects discussion under Alternatives 1, 3, and 5 outlines those present and foreseeable future activities scheduled on public and private lands.

Alternative 4 Contribution/Summary: Alternative 4 is not expected to contribute to direct, indirect, or cumulative effects related to disturbance. The indirect consequence under this alternative is related to the influence not reforesting areas adjacent to Cherry Lake would impact bald eagles. It is unknown how much and when natural forest recovery would occur adjacent to Cherry Lake, which could delay the availability of nest, perch, and roost sites in the area. Thinning plantations and removing dead material would result in faster growth rates of remaining trees and increasing the resiliency of these stands, reducing the risk of loss when fire returns to this area. There is limited potential for toxicological effects from herbicide use to bald eagles under Alternative 4. The cumulative contribution of this alternative on bald eagles is considered minor and is not expected to affect the viability of this species.

Bald Eagle: Summary of Effects

Effects to bald eagles under all action alternatives are considered negligible to minor. Alternatives 1, 3, and 5 would result in the accelerated development of forested habitat adjacent to Chery Lake, which would more quickly benefit bald eagles using this area. Thinning of existing plantations is the same under all action alternatives and is expected to benefit bald eagles through the accelerated growth of remaining trees and resiliency when fire returns to the landscape.

Determination of Effects

ALTERNATIVES 1 AND 5

Alternatives 1 and 5 may affect individuals but are not likely to result in a trend toward Federal listing or loss of viability for the bald eagle. My determination is based on the following rationale:

- These alternatives include actions to accelerate the development of forested habitat adjacent to Cherry Lake, an occupied bald eagle territory.
- These alternatives would improve existing plantation conditions by accelerating growth rates of potential nest, perch, and roost trees and improving stand resilience when fire returns.
- These alternatives may result in negligible affects from herbicide use.

ALTERNATIVE 2

Alternative 2 may affect individuals but are not likely to result in a trend toward Federal listing or loss of viability for the bald eagle. My determination is based on the following rationale:

- No actions would occur to potentially impact this species or habitat. However, with no action to accelerate the development of important habitat elements such as perch, roost, or nest sites adjacent to Cherry Lake, there are consequences to this alternative.

ALTERNATIVE 3

Alternative 3 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the bald eagle. My determination is based on the following rationale:

- This alternative includes actions to accelerate the development of forested habitat adjacent to Cherry Lake, an occupied bald eagle territory.
- This alternative would improve existing plantation conditions by accelerating growth rates of potential nest, perch, and roost trees and improving stand resilience when fire returns.

ALTERNATIVE 4

Alternative 4 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the bald eagle. My determination is based on the following rationale:

- This alternative does not include actions to accelerate the development of forested habitat adjacent to Cherry Lake, an occupied bald eagle territory.
- This alternative would improve existing plantation conditions by accelerating growth rates of potential nest, perch, and roost trees and improving stand resilience when fire returns.
- This alternative may result in negligible affects from herbicide use.

Bald Eagle: Compliance

Regional habitat management guidelines are provided by USFWS 2007. As per USFWS 2007, the proposed activities in the action alternatives fall under Category C. Timber Operations. Under Category C, the following is required:

- Avoid removal of trees within 330 feet of the nest at any time.
- Avoid timber harvest operations during the breeding season within specified buffers.

The action alternatives demonstrate compliance with USFWS 2007 as follows:

- No tree removal is proposed within 330 feet of the nest.
- No timber harvest is within designated buffers requiring a limited operating period

Additionally, under Recommendations to Benefit Bald Eagles: Alternatives 1, 4, and 5 demonstrate compliance with USFWS 2007 as follows:

- Use of herbicides would only be used in accordance with Federal and state laws.

This project complies with forest plan direction and the National Bald Eagle Management Guidelines (USFWS 2007).

Great Gray Owl: Affected Environment

Species and Habitat Account

The great gray owl (*Strix nebulosa*) is a Region 5 Forest Service Sensitive species and is listed as Endangered under the California Endangered Species Act. The great gray owl occurs from Alaska to northern and south-central Ontario, Idaho, Montana, Wyoming, central Seskachewan, northern Minnesota, and California (USDA 2006). In California, they occur in the Sierra Nevada from the vicinity of Quincy and Plumas County, south to Yosemite National Park (CDFW 2008).

Hull et al. 2010 and Hull et al. 2014 found that great gray owls in the Yosemite area (i.e. including the Rim Fire area), are a genetically-unique population warranting subspecies status as *ssp. yosemitensis*. The genetic analysis completed by Hull et al. (2010) indicates that the *S.n. yosemitensis* population has experienced a recent genetic bottleneck and exhibits a small effective population size. Both of these factors are a significant conservation concern. The limited genetic diversity in this population may contribute to population instability because of the already low population levels, low census numbers, limited migration potential, and the potential for inbreeding depression (Ibid).

Great gray owls are regarded as locally rare throughout their range in USFS Region 5 and no more than 100-200 individuals have been estimated in California since 1980. Although the great gray owl population in California is small, the Stanislaus National Forest contains more great gray owl sites than any other National Forest in Region 5, or any area outside of Yosemite National Park (Siegel 2001, 2002, USDA 2015a. Of the great gray owl sites on the Stanislaus National Forest, most are concentrated within the Rim Fire perimeter in areas that border Yosemite National Park.

Great gray owl sites are identified through the use of protocol surveys (Beck and Winter 2000, Keane et al. 2011). Protocol surveys for great gray owl have been conducted throughout the Rim Fire area for the past two decades. These surveys are best described as twofold: management oriented and research oriented. Management oriented survey work is generally opportunistic depending upon planned activities and funding levels. Research oriented survey work is generally more systematic and focused. Together these efforts have occurred at a level such that inventory information for the analysis area is considered essentially complete. Surveys have been conducted in the two breeding seasons post-fire (2014-2015) and we have documented great gray owls in four territories within the Rim Fire area.

The project action area is within the current distribution of great gray owls across the Sierra Nevada Bioregion. There are 13 territories documented within the action area. LOPs would be placed around all documented great gray owl PACs from March 1-August 15 of any given year during project implementation.

General habitat requirements for great gray owls include forested environments with high canopy cover and large trees that feature vegetation types such as Sierran Mixed Conifer, White fir, Red fir, Montane Hardwood, Montane Hardwood Conifer, Wet meadows, and Ponderosa Pine (CDFW 2008, Van Riper III and Van Wagtendok 2006). They typically nest in dense canopied forested stands adjacent to meadows or meadow complexes in large flat-topped broken snags. Availability of nesting structures and prey may limit the use of otherwise suitable habitat. Green (1995) found that occupied great gray owl sites had greater plant cover, vegetative height, and soil moisture. Canopy closure was the only variable of three variables measured (canopy closure, number of snags greater than 24 inches dbh, and number of snags less than 24 inches dbh) that was significantly higher in occupied sites versus unoccupied (Ibid). Home ranges have recently been estimated for Yosemite National Park. Breeding female home range size has been estimated at 152 acres while winter home ranges average 6,072 acres. Male breeding home ranges are estimated at 49 acres and winter home ranges average 5,221 acres (Van Riper III and Van Wagtendok 2006). Moderate to High Capability habitat is defined as that in which a CWHR suitability rating is ≥ 0.55. Two of three categories (reproduction, cover, food) must have a medium rating to achieve the minimum rating. Reference CWHR version 8.2 users' manual for further explanation on suitability ratings (CDFW 2008). Acres include National Forest system lands only. This includes Sierran mixed conifer, ponderosa pine, and white fir in CWHR type, size, and class (4M, 4D, 5M, 5D). There are about 40,000 acres of moderate to high capability year round habitat within the project action area on National Forest System lands only. This habitat is arranged in two general areas within the Rim fire perimeter; one area on the north end where Rim Fire burn severity was low to moderate and another area near the Highway 120 corridor. These two areas are disjunct, potentially prohibiting north to south movement or dispersal. Suitable breeding habitat is defined as suitable forested stands (4D, 5M, 5D) within 300 meters of an associated meadow or meadow complex. Survey data from occupied territories on the STF have documented great gray owls successfully nesting in stands classified by CWHR as 4D, thus this size and density class was included as highly suitable breeding habitat. About 2,387 acres is highly suitable breeding habitat on National Forest System lands and is unevenly distributed throughout the project area. There are about 73,700 acres of medium to highly suitable year round habitat within the cumulative effects analysis area.

Beck (1985), Bull and Duncan (1993), CDFW (2008), and Greene (1995) also describe suitable foraging habitat as follows:

- Open meadows and grasslands in forested areas
- Open woodlands and coniferous stands with herbaceous or shrub component
- Dense herbaceous cover, vegetative height and adequate soil moisture to provide suitable conditions for prey
- Trees, snags, and fence posts present to serve as hunting perches

The diet of great gray owls may vary locally, but consists of small mammals, primarily rodents. Current literature indicates that great gray owls in the western United State overwhelmingly select two prey taxa: voles and pocket gophers (Bull and Duncan 1993). Voles prefer meadows with dense herbaceous vegetative cover (CDFW 2008). While it has been suggested by Beck (1985) that herbaceous heights ranging from 5 to 15 inches is suitable for voles, Greene (1995) found 12 inches to be preferred. Gophers are typically subterranean but also appear to have herbaceous cover preferences (Ibid). Compaction of meadow soils may reduce suitability of areas for gophers.

Not much is known on dispersal patterns in great gray owls. Bull et al (1988a) reported that maximum dispersal distance for juvenile owls to be 4.6 and 19.9 miles from their natal sites. They aren't considered migratory, though adults make short elevation movements during winter, presumably to areas with lower snow depths (Hayward and Verner 1994). In Oregon, adults exhibit nest site fidelity, 78 percent returning to within 0.6 miles of the previous year's nest site (Bull et al. 1988b).

Recent burns, where they exist in the Sierras, provide some structural similarity to a meadow ecosystem for a few years before the trees or brush shade out the grasses and forbs (Beck and Winter 2000). Such sites can provide foraging areas for nearby breeding great gray owls in the short-term (Greene 1995, Beck pers.comm.). Meadows or meadow complexes at least 25 acres in size appear to be necessary for persistent occupancy and reproduction but meadows as small as 10 acres will support infrequent breeding (Beck and Winter 2000). Reproductive sites are associated with high vole abundance and high vole abundance is associated with meadow vegetation height (Beck 1985; Greene 1995; Sears 2006, Kalinowski et al. 2014).

All great gray owl PACs burned at mixed severity in the Rim Fire. Overall, approximately half of all PAC acres burned at high severity (> 75% basal area mortality) and approximately 69% of known and potential nest sites were lost in the fire. There is potential for great gray owls to nest in burned forest (Beck, pers.comm.) and post-fire conditions may also provide preferred foraging habitat in the short-term (Greene 1995).

Mean home-range size in the Sierra Nevada during a radio-tagging study was estimated at 148 acres in females and 50 acres in males during the breeding season; great gray owls enlarge their home ranges substantially in winter (Van Riper and Van Wagtendonk 2006). Most detections of great gray owls are within 300 meters of meadow habitat (Green 1995, Van Riper and Van Wagtendonk 2006, Winter 1986).

Risk Factors

USDA (2006d) summarized risk factors potentially influencing great gray owl abundance and distribution:

1. *Habitat loss and degradation* - Green tree and salvage timber harvest can eliminate potential nest trees.
2. *Range Management* - Grazing can remove cover necessary for prey species and degrade meadows, thereby lowering water tables and reducing productivity of grasses and forbs that are food sources for prey.
3. *Collision with automobiles* – Great gray owls are particularly susceptible to collisions with vehicles.
4. *Disease* – The effect of West Nile virus on owl populations is uncertain; however, given mortality rates in other avian species that have contracted this disease, a high mortality rate could be expected in infected great gray owls.
5. *Disturbance at nest and roost sites* - There is little information on disturbance and great gray owls; however, it is logical to assume they would respond like other owls. Spotted owls are known to have increased stress levels to disturbance such as chainsaw use and proximity to logging roads, which may affect reproduction (USFWS 2006b, and Wasser et al. 1997).

Management Direction

Current management direction is defined by project-level standards and guidelines from the Forest Plan (USDA 2010) and is based on the desired future condition of land allocations (Robinson 1996). The desired condition for great gray owl PACs includes the forested area and adjacent meadow around all known great gray owl nest stands. The PAC encompasses at least 50 acres of the highest quality nesting habitat (CWHR types 6, 5D, and 5M) available in the forested area surrounding the nest. The desired condition for PACs also includes the meadow or meadow complex that supports the prey base for nesting owls (USDA 2010 p.187).

There is also an emphasis to conduct additional surveys to established protocols to follow up reliable sightings of great gray owls (USDA 2010 p. 43).

Great Gray Owl: Environmental Consequences

The project alternatives could result in direct and indirect effects to the great gray owl through the following activities:

- Mechanical site prep for planting.
- Herbicide application for site prep and release of conifers.
- Planting and thinning conifers.

These actions may have direct and indirect effects on great gray owls through the following:

- Project related death, injury, or disturbance.
- Project related modifications to habitat quantity and/or quality.

Death, injury and disturbance

Death, injury, and disturbance are potential direct effects to consider for great gray owl. Project activities have the potential to cause death or injury by tree-falling or by the use of heavy equipment. The great gray owl is also susceptible to getting "roadkilled". Collision with vehicles is a major cause of mortality (Keane et al. 2011); great gray owls tend to fly low over the ground in open areas especially adjacent to meadows (Bull and Duncan 1993). The management requirement of LOPs, mitigates the probability that death or injury would occur as a result of project activities. Loud noise from equipment such as chain saws or tractors is expected to occur in reforestation units and staging areas. Human presence in nest stands and loud noise in the vicinity of nest stands have the potential to change normal behavior and potentially impair essential behavior patterns of the great gray owl related to breeding, feeding, or sheltering. The potential for disturbance under all action alternatives is minimized by the implementation of Limited Operating Periods (LOPs) as a management requirement.

The location of nest sites or activity centers are more uncertain following large-scale disturbance events (Keane, pers. comm.); conducting surveys to establish or confirm any new locations of nests or activity centers is a way to address this movement uncertainty (USDA 2004). Conducting protocol surveys is a management requirement common to all action alternatives.

Habitat modification

Forested habitat is required by roosting and nesting great gray owls (Beck 1985, Greene 1995, Van Riper and Van Wagtendonk 2006, Winter 1981). Van Riper and Van Wagtendonk (2006) found that a significant proportion of breeding home ranges for females (73 percent) and males (75 percent) are comprised of forested habitat. Additionally, habitat loss has been identified as a risk influencing great gray owl abundance and distribution. Reestablishing forest habitat across the landscape and in close association with meadows is critical to ensure the viability of great gray owls in this landscape long-term.

Retention of snags and large downed woody debris is proposed under all action alternatives. Snags and down logs are important habitat elements for great gray owls and their prey (USDA 2001, Bull and Henjum 1990). Sears (2006) found that sites with a higher density of large snags were more likely to be occupied by great gray owl. Juveniles use leaning trees and snags for roosting before they can fly, and high stem density in stands are used by juveniles for cover and protection (Bull and Henjum 1990). Bull and Henjum (1990) noted that roosts accessible to flightless young, such as leaning and deformed trees and perches high enough to avoid terrestrial predators, may increase reproductive success. Retention of snags and large downed wood across the landscape will provide hunting, roosting, and potentially nesting sites when associated with roosting or foraging habitat. These features are considered biological legacies in this post fire environment and will play important roles in the structure of future forest (Lindenmayer et al. 2008).

As great gray owls concentrate activities around meadows and have relatively small breeding home ranges, the potential for habitat modification effects are expected to be most pronounced in and near meadows as well as PACs.

Indicators

The following indicators were chosen to provide a relative measure of the direct and indirect effects to the great gray owl and to determine how well project alternatives comply with Forest Plan Direction.

1. Acres of future moderate and high capability breeding habitat planted and thinned.
2. Toxicological effects from herbicide use.

These criteria were chosen based on the best available scientific literature which focuses on various aspects of great gray owl ecology and life history requirements. These criteria focus on those life history aspects, or habitat elements, considered most limiting to great gray owl persistence across their range and where project effects are expected.

Alternatives 1, 3, and 5

Because there is very little difference in the planting prescription under these three alternatives, the effects are expected to be similar and are analyzed together.

DIRECT AND INDIRECT EFFECTS

Indicator 1. *Reforestation (includes natural regeneration)*: There are about 1,700 acres proposed for reforestation within 300 meters of meadow habitat across the project area under Alternatives 1, 3, and 5. Planting conifers as prescribed under these alternatives would result in maximizing the reestablishment of forested habitat across this landscape when compared to Alternatives 2, and 4. These alternatives would provide the most habitat for great gray owls in close proximity to meadows in the long-term. Because habitat loss has been identified as a significant risk to great gray owl persistence across their range, reestablishing forest habitat across the landscape is paramount. Planting areas around meadow habitat as proposed under these alternatives would more quickly improve habitat conditions in the areas most important for breeding great gray owls.

Thinning: There are about 600 acres of existing plantation within 300 meters of meadow habitat proposed for thinning. These units are located throughout the project area and associated with several meadows, including Ackerson Meadow which is currently occupied by great gray owls. While some of these plantations are considered suitable because they are CWHR size class 4 or 5 and have greater than 40 percent canopy cover, they lack structural diversity. Thinning these plantations would promote vertical and horizontal diversity which in turn improves habitat capability. The goal is to open up these stands, creating a habitat mosaic with individual trees, clumps of trees, and openings. The ICO design would provide structural diversity where it does not currently exist. For example, the prescription calls for releasing oaks and retaining a diversity of species and sizes of residual trees.

After thinning, remaining trees are expected to grow faster and understory vegetation would become established, improving habitat conditions for great gray owls and their prey in the short and long-term. In addition, by breaking up the continuity of vegetation, the habitat would be more resilient when fire or other stochastic events occur.

Indicator 2. Under Alternatives 1 and 5, herbicide use is expected to have a limited potential for direct or indirect toxicological effects on great gray owls, as described under the herbicide risk assessment section. Because no herbicides are proposed under Alternative 3, there would be no exposure to herbicides and no direct, indirect, or cumulative toxicological effects to great gray owls under this alternative.

CUMULATIVE EFFECTS

The Forest queried its databases, including the Schedule of Proposed Actions (SOPA) to determine present and reasonably foreseeable future actions as well as present and reasonably foreseeable future actions on other public (non-Forest Service) and private lands (Appendix B, Rim Reforestation EIS). Some, but not all of these actions have or may contribute cumulatively to effects on great gray owls.

Relevant risk factors potentially affecting great gray owl abundance and distribution have been identified and primarily include habitat loss and degradation including loss of nest sites. Exposure to herbicides and potential toxicological effects associated with exposure were also identified as having the potential to affect great gray owls. The following evaluation criteria were used as relative measures of cumulative effects from Alternatives 1, 3, and 5: breeding habitat suitability. In addition, toxicological effects were used as evaluation criteria for Alternatives 1 and 5.

Breeding Habitat Suitability

Federal Lands: Present and foreseeable future activities on federal lands include: Funky Stewardship, Groovy Stewardship, Reynolds Creek Stewardship, Soldier Creek Timber Sale, Campy Timber Sale, Looney Timber Sale, Thommy Timber Sale, which are green thinning projects treating 6,546 acres of green forest across the analysis area. All snags and many declining trees will be retained unless they pose a safety hazard in these projects. The snag and declining tree retention will provide snags that could serve as potential nest sites for great gray owls in the short-term as well as recruits for future nest sites in the long-term. Fuels reduction associated with the Rim Recovery project would reduce the risk of further loss of remaining green forest within the project area. Other federal activities potentially impacting breeding habitat for great gray owls is livestock grazing, meadow restoration, and the creation of great gray owl nest structures.

Thirteen grazing allotments are either wholly or partially within the analysis area, resulting in a maximum number of 1,632 cow/calf pairs across the landscape. Livestock grazing may influence the abundance and availability of prey in wet meadows great gray owls use for foraging (Kalinowski et al. 2014).

Livestock grazing is subject to utilization and forest plan standards that are specifically designed to minimize grazing impacts on great gray owl prey. Meadow restoration projects (Reynolds Creek, Rim Fire Rehabilitation, Twomile Meadow Restoration) are expected to improve foraging habitat across about 180 acres for great gray owl. The Rim Fire Rehabilitation project will also result in the creation of 30 to 50 nest structures adjacent to several meadows, replacing those lost in the fire as well as adding structures within the analysis area. Based on the biological evaluations for each of these projects, short- term impacts are minimized and great gray owl habitat is expected to improve in the long-term with implementation of these projects.

Toxicological Effects

Federal lands: There is one present federal action of herbicide use on 0.5 acres under the Rim Fire Rehabilitation project and two foreseeable federal actions of herbicide use: 8 acres under the Twomile

Ecological Restoration Noxious Weed project and 23 acres associated with a special use permit for the Reliable Power Project to control vegetation under powerlines. There are no other present or foreseeable future federal actions related to herbicide use.

Private lands: Herbicide use is proposed on 1,583 acres of private land within the project area in 2017. No other present or foreseeable future actions are proposed on private lands related to herbicide application.

Alternatives 1 and 5 contribution/summary: Alternatives 1 and 5 would contribute cumulatively to short and long-term beneficial effects on great gray owl by providing suitable breeding habitat across 1,700 acres more quickly than the other action alternatives. Alternatives 1 and 5 would also contribute cumulatively to short and long-term beneficial effects on great gray owls by providing higher quality breeding habitat across 600 acres of existing plantation proposed for thinning. These alternatives would result in similar benefits with respect to existing plantation thinning when compared to Alternative 4 because the thinning prescription is the same under all action alternatives. Alternatives 1, 3, and 5 would complement the new nest structures being constructed adjacent to several of the meadows considered herein. Alternatives 1 and 5 would contribute to the short-term limited potential of exposure to toxicity from herbicide use. The long-term benefits of herbicide use include the eradication of noxious weeds near Ackerson Meadow and Jawbone Lava Flat, which is expected to have beneficial effects on the habitat used by prey species important to great gray owls. The cumulative contribution under these alternatives may beneficially affect individual territories and the viability of this species.

Alternative 2

DIRECT AND INDIRECT EFFECTS

Under No Action, death, injury or disturbance would not be an issue because no active management would occur.

Indicator 1. The indirect effects of no action are primarily related to the influence no action may have on the amount and location of developing coniferous forest and how that may affect great gray owls. Because no active management would occur, it is unknown where naturally regenerating forest would occur, how long it would take to develop, and what benefits that would provide great gray owls. Research and our own data from the project area show that areas in close proximity to live trees (i.e. seed source) would experience limited forest expansion (Bonnet et al. 2005). Natural conifer expansion is sporadic, could be delayed for decades due to shrub suppression, and would not likely result in significant gains in forested habitat (Vegetation, Chapter 3.13). This could have greater implications for this population of great gray owls because they are already considered uncommon and rare on this landscape. If we do not plant conifers and reestablish breeding habitat in close proximity to meadows, the reduction in habitat availability could affect the number of great gray owls we are able to support on the Stanislaus National Forest. Existing plantations would not be thinned under this alternative; therefore the benefits of increased structural diversity and improved habitat quality would not be realized. The plantations could be at greater risk of loss when fire returns to this landscape because of the tightly spaced live trees and fuel loading from fire killed trees (Fuels, Chapter 3.05).

Indicator 2. Because no herbicides are proposed under this alternative, there would be no exposure to herbicides and no direct, indirect, or cumulative toxicological effects to great gray owls under this alternative.

CUMULATIVE EFFECTS

The cumulative effects discussion under Alternatives 1, 3, and 5 outline those present and foreseeable future activities scheduled on public and private lands.

Under Alternative 2, no direct cumulative effect is expected because no active management would occur, however, there may be indirect consequences under this alternative primarily related to the influence no action may have on future forest development and how that may impact great gray owls. It is unknown if forest would naturally regenerate adjacent to meadows, which is a critical component of suitable breeding habitat for great gray owls. The cumulative contribution under this alternative may negatively affect individual territories and may affect the number of great gray owls supported on the Stanislaus National Forest. It is unknown if this alternative would affect the viability of the species.

Alternative 4

DIRECT AND INDIRECT EFFECTS

Indicator 1. *Reforestation*: Under Alternative 4, up to 23 acres is proposed for reforestation within 300 meters of meadow habitat. The effects associated with this alternative are considered the same as under the no action, see discussion under Alternative 2.

Thinning: Effects are the same as discussed under Alternatives 1, 3, and 5.

Indicator 2. Herbicide use is expected to have a limited potential for direct or indirect toxicological effects on great gray owls, as described under the herbicide risk assessment section.

CUMULATIVE EFFECTS

The cumulative effects discussion under Alternative 1 outlines those present and foreseeable future activities scheduled on public and private lands.

Alternative 4 Contribution/Summary: Under this alternative, only a maximum of 23 acres is proposed for planting within 300 meters of meadow habitat. The cumulative contribution of Alternative 4 is primarily related to the influence this alternative may have on future forest development and how that may impact great gray owls. This alternative would not complement the existing plantation thinning nor would it completely complement the new nest structures being constructed adjacent to several of the meadows considered herein. This alternative would contribute cumulatively to short and long-term beneficial effects on great gray owls by providing suitable breeding habitat across 600 acres of existing plantation proposed for thinning. This alternative would result in similar benefits with respect to existing plantation thinning when compared to Alternatives 1, 3, and 5 because the thinning prescription is the same under all action alternatives. The long-term benefits of noxious weed treatments near Ackerson Meadow and Jawbone Lava Flat could be realized if prescribed fire and grazing are successful. Benefits include improved habitat condition in these areas used by prey species important to great gray owls. Alternative 4 would contribute to the short-term limited potential of exposure to toxicity from herbicide use. The cumulative contribution under this alternative may negatively affect individual territories and may affect the number of great gray owls supported on the Stanislaus National Forest. It is unknown if this alternative would affect the viability of the species.

Great Gray Owl: Summary of Effects

Indicator 1. Table 3.16-7 shows the number of acres proposed for reforestation (planting) and the number of acres of existing plantation proposed for thinning within 300 meters of meadow habitat. Alternatives 1, 3, and 5 would provide the more future breeding habitat for great gray owls when compared to Alternative 4. All action alternatives would result in the same amount of future breeding habitat within the treated existing plantations; however, Alternative 4 does not complement the existing plantation treatments by accelerating forest reestablishment in adjacent areas as proposed under Alternatives 1, 3, and 5.

Table 3.16-7 Great Gray Owl Summary of Effects

Indicator	Metric	Alternative				
		1	2	3	4	5
1. Future moderate to high capability habitat (planted or thinned)	Acres reforested[1]	1,700	0	1,700	0	1,700
	Acres of existing plantation thinned	600	0	600	600	600
	Total	2,300	0	2,300	600	2,300

[1] Includes natural regeneration

Indicator 2. Herbicide use under Alternatives 1, 4, and 5 are expected to have limited potential for direct or indirect toxicological effects on great gray owls. Because Alternative 4 has fewer acres of herbicide application proposed, the potential for effects would be less than under Alternatives 1 and 5. However, it is important to note that the toxicity exposure scenarios analyzed in the risk assessment show that all HQs are several orders of magnitude less than the NOAEL threshold of concern or No Observable Adverse Effect Level; therefore, great gray owls are provided an adequate margin of safety in the event that they are exposed to contaminated prey or water.

Determination of Effects

ALTERNATIVES 1 AND 5

It is my determination that Alternatives 1 and 5 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the great gray owl. My determination is based on the following rationale:

- These alternatives include actions to reestablish forested habitat adjacent to meadows, accelerating the time in which these areas would be suitable for breeding.
- These alternatives include actions to thin existing plantations, accelerating the time in which these areas would be suitable for breeding.
- These alternatives require the use of LOPs to reduce disturbance potential.
- These alternatives provide for surveys to establish or confirm the location of activity centers and boundaries.
- Toxicity exposure levels from herbicide use under these alternatives are all several orders of magnitude below the Forest Service established threshold of concern.

ALTERNATIVE 2

It is my determination that Alternative 2 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the great gray owl. My determination is based on the following rationale:

- No actions would occur to potentially impact this species or habitat. However, with no action to reestablish forested habitat, this alternative would result in less available breeding habitat in the short and long-term.

ALTERNATIVE 3

It is my determination that Alternative 3 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the great gray owl. My determination is based on the following rationale:

- This alternative includes actions to reestablish forested habitat adjacent to meadows, accelerating the time in which these areas would be suitable for breeding.
- This alternative includes actions to thin existing plantations, accelerating the time in which these areas would be suitable for breeding.

- This alternative requires the use of LOPs to reduce disturbance potential.
- This alternative provides for surveys to establish or confirm the location of activity centers and boundaries.

ALTERNATIVE 4

It is my determination that Alternative 4 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the great gray owl. My determination is based on the following rationale:

- This alternative includes actions to thin existing plantations, accelerating the time in which these areas would be suitable for breeding.
- This alternative requires the use of LOPs to reduce disturbance potential.
- This alternative provides for surveys to establish or confirm the location of activity centers and boundaries.
- Toxicity exposure levels from herbicide use under this alternative are all several orders of magnitude below the Forest Service established threshold of concern.

Great Gray Owl: Compliance with Forest Plan

Applicable Forest Plan Direction

USDA 2010 p. 187: Apply a limited operating period, prohibiting vegetation treatments within ¼ mile of an active great gray owl nest stand, during the nesting period (typically March 1 to August 15).

USDA 2010 p. 44: General guidelines for large-snag retention are as follows: 1) in westside mixed conifer and ponderosa pine types - four of the largest snags per acre.

Forest Plan Direction Compliance

THE ACTION ALTERNATIVES 1, 3, 4 AND 5 DEMONSTRATE FOREST PLAN COMPLIANCE THROUGH THE FOLLOWING

Alternatives 1, 3, 4, and 5 apply LOPs as required.

Alternatives 1, 3, 4, and 5 manage appropriate land allocations consistent with old forest objectives for higher than average levels of snags and down woody material and retain snags in other land allocations as guided in the forest plan.

California Spotted Owl: Affected Environment

Species and Habitat Account

The California spotted owl (*Strix occidentalis occidentalis*) is a Region 5 Forest Service Sensitive species and is also a Sierra Nevada Management Indicator Species (MIS). They are listed with the State of California as a Species of Special Concern. The California spotted owl occurs from the southern Cascades, throughout the Sierra Nevada in California and into Nevada, mountainous regions of southern California and the central Coast Ranges up to Monterey County (USDA 2001). They breed from 1,000 to 7,700 feet elevation. On the west slope of the Sierra Nevada, they use a wide range of habitat types and are considered year round residents (Ibid).

On December 23, 2014, a petition to list the California Spotted Owl was submitted to the USFWS. USFWS has not published information in the Federal Register to date and the USFWS website has identified this species as “under review” (USFWS 2015a). USFWS published their California spotted owl determination in the Federal Register Notice for Endangered and Threatened Wildlife and Plants; 90-Day Findings on 25 Petitions (USFWS 2015b): "Based on our review of the petitions and sources cited in the petitions, we find that the petitions present substantial scientific or commercial information indicating that the petitioned action may be warranted (emphasis added) for the

California spotted owl (*Strix occidentalis occidentalis*) based on Factors A, D, and E. However, during our status review, we will thoroughly evaluate all potential threats to the species." (USFWS 2015b, p. 56426). The USFWS review includes subjecting the petition to rigorous critical review, and soliciting additional information from parties outside the agency. This 90-Day finding does not change the status of this species.

The most recent population status and trend information can be found in Keane 2014, Conner et al. 2013, Tempel and Gutiérrez 2013, and Tempel et al. 2014. In summary, the most recent estimate of population size for California spotted owls in the Sierra Nevada reported 1865 owl sites, with 1399 sites on National Forest System lands. Ongoing research of recent population trends indicates increasing evidence for population declines on the three demographic study areas on National Forest System lands and a stable or increasing population on the National Park study area, (Conner et al. 2013, Tempel and Gutiérrez 2013, Tempel et al. 2014). The factors driving these population trends are not known (Keane 2014).

California spotted owl sites are identified through the use of protocol surveys (USDA March 12, 1991). Protocol surveys have been conducted throughout the Rim Fire area for the past two decades. These surveys are best described as opportunistic depending upon planned activities and funding levels but have occurred at a level such that inventory information for the analysis area is considered essentially complete.

The project action area is within the area of current distribution of spotted owls across the Sierra Nevada Bioregion. There are currently 44 spotted owl territories within the project area; this includes two new territories documented post-fire. LOPs would be placed around all documented spotted owl protected activity centers from March 1-August 15 of any given year during project implementation.

California spotted owls are top trophic-level avian predators associated with heterogeneous forests characterized by areas with large trees, large snags, and large down woody material (North et al. 2009, Roberts and North 2012, Keane 2014). General habitat requirements for spotted owls include forested environments with high canopy cover that feature vegetation types such as Montane Hardwood, Montane Hardwood Conifer, Ponderosa Pine, Douglas Fir, Sierran Mixed Conifer, and White Fir with trees in CWHR size classes 4 and 5 with greater than 40% canopy cover (CDFW 2008). The most valuable habitat has trees greater than 24" dbh and canopy cover greater than 70%. Approximately 50 percent of known owl sites are found in mixed conifer forest (USDA 2001). They prefer forested stands with complex vertical and horizontal vegetative structure. Recent research suggests that within their habitat matrix, spotted owls depend on "green" stands with the aforementioned characteristics for nesting, repeated roosting, and for foraging. Spotted owls use a broader range of vegetation conditions for foraging than they do for nesting and roosting (Ibid.), and this includes post-fire habitats as discussed below. Home range size for this species is highly variable and ranges from 2,500 acres on the Sierra National Forest, 4,700 acres on the Tahoe and Eldorado National Forests, and 9,000 acres on the Lassen National Forest (USDA 2001). There are about 39,957 acres of moderate to high capability habitat within the analysis area. Suitable habitat has been greatly reduced in the heart of the analysis area and connectivity between large tracts of habitat on the forest and areas in Yosemite has been further reduced. This habitat fragmentation has reduced the probability of spotted owls accessing and utilizing all available habitat within the analysis area. Either natural regeneration recovery or forest management practices, such as planting, is needed to effectively reestablish connectivity and make suitable habitat readily available to spotted owls using this landscape. There are about 69,174 acres of moderate and high capability habitat within the cumulative effects analysis area, including all ownerships.

Moderate to High Capability habitat is defined as that in which a CWHR suitability rating is ≥ 0.55. Two of three categories (reproduction, cover, food) must have a medium rating to achieve the

minimum rating. Reference CWHR version 8.2 users' manual for further explanation on suitability ratings (CDFW 2008). Acres include National Forest system lands only.

Breeding typically occurs in late winter to spring and is dependent on elevation and weather conditions. USDA (2001) cites six studies that summarize spotted owl nesting and roosting habitat preferences:

- 70 to 95 percent total canopy cover at about 30 feet.
- Two or more canopy layers.
- Dominant and co-dominant trees in the canopy averaging at least 24 inches dbh.
- Total live basal area equal to 185 to 350 square feet per acre.
- Total snag basal area equal to 30 to55 square feet per acre.
- Higher than average levels of snags, at least 15 inches dbh and 20 feet tall.
- Downed woody debris averaging 10 to 15 tons per acre, comprised of the largest logs.

Spotted owls use several different nest types; natural cavities in standing trees (live or dead), broken top trees and snags, platform nests created by other species, on debris accumulations, and dwarf mistletoe brooms (Ibid). Blakesley and others (2005) report nest tree sizes range from 14 to 86 inches dbh,with 90 percent of these greater than 30 inches dbh. Data from the Stanislaus National Forest show trees or snags ranging from 24 to 56 inches dbh have been selected as nest trees (USDA 2015b).

Spotted owls consistently use forested stands with greater: canopy cover, total live basal tree area, basal area of hardwoods and conifers, snag basal area, and dead and downed wood, when compared to random locations (USDA 2001). Stands preferred by foraging owls consist of:

- At least 50 to 90 percent canopy cover at about 30 feet.
- At least two canopy layers.
- Dominant and co-dominant trees averaging at least 11 inches dbh.
- Total live tree basal area equal to 180 to 220 square feet per acre.
- Total basal area of snags equal to 15 to 30 square feet per acre.
- Higher than average levels of snags, at least 15 inches dbh and 20 feet tall.
- Downed woody debris averaging 10 to15 tons per acre, comprised of the largest logs.

Spotted owls typically hunt from elevated perches and will also hunt on the wing. Males will deliver food to nesting females, and both sexes cache excess prey for later consumption. The primary prey species at lower elevations are woodrats, and at higher elevations flying squirrels. They also prey upon gophers, bats, arthropods, and a variety of other rodents (CDFG 2008, Verner et al. 1992).

Spotted owls show the strongest associations with mature forest conditions for nesting and roosting but will forage in a broader range of vegetation types (Keane 2014). Recent research indicates that California spotted owls will occupy landscapes that experience low-to moderate-severity wildfire, as well as areas with mixed-severity wildfire that include some proportion of high-severity fire (Bond et al. 2009, Bond et al. 2010, Roberts et al. 2011, Lee et al. 2012, Bond et al. 2013, Lee et al. 2013). It is important to note that because of the overall size and severity of the Rim Fire, many owl sites in the Rim Fire had far larger proportions of core areas burned at high severity relative to any of these studies. How owls use habitat for foraging where high severity patch sizes are relatively large, and the relationship of owl use to the amount and arrangement of burned-unburned edge, among other factors needs further study (such as the research PSW currently being conducting within the Rim Fire area). In the closely related Northern spotted owl, Clark (2007) found that while spotted owls did roost and forage within high severity burn areas, the use was very low suggesting that this cover type was poor habitat for spotted owls. Clark et al. (2013) summarized the results provided by the few studies that have been conducted on spotted owls in burned landscapes and noted that results were equivocal. Eyes (2014) found that overall, California spotted owls avoided high severity forest patches and used lower severity patches, similar to Clark (2007). In summary, uncertainties remain regarding long-term

occupancy and demographic performance of spotted owls at burned sites (Keane 2014). Specifically, uncertainty exists regarding how the amounts and patch sizes of high-severity fire will affect California spotted owl occupancy, demographics, and habitat over long time frames (Ibid). Spotted owls continue to occupy the project area, and are consistently located roosting and nesting in green forest including areas that burned at low to moderate severities, not in areas where high severity fire removed virtually all canopy cover.

Dispersal distances for spotted owls are not well studied. Northern spotted owl juveniles are expected to disperse at least eight miles (USDA 2001). A study of natal dispersal in an insular population in southern California documented male dispersal distances ranged from 1.4 to 22.6 miles and female dispersal distances ranged from 0.25 to 22 miles (Lahaye et al. 2001). Breeding dispersal probability was found higher in younger owls, single owls, paired owls that lost their mates, owls at lower quality sites, and owls that failed to reproduce in the year preceding dispersal (Blakesley et al. 2006). Dispersal distances were similar in both males and females and ranged from 0.62 to 20.5 miles (Ibid). Spotted owls are not migratory but may move down slope to lower elevations during winter months.

Risk Factors

USFWS (2006c) and USDA (2001 and 2004) summarized risk factors potentially influencing California spotted owl distribution and abundance:

1. *Habitat Loss* – USFWS determined the primary threat to spotted owls is loss of habitat to high-severity wildfire that has resulted from fire suppression and past fire management policy. Habitat loss or modification from vegetation management and effects to the distribution, abundance and quality of habitat are also a concern. Logging since the turn of the century has resulted in a reduction in the amount and distribution of mature and older forests and specific habitat elements such as large trees, snags, and downed logs, used for nesting and foraging by California spotted owls.
2. *Habitat Fragmentation* - This is of particular concern on the STF because there are large inclusions of non-federal lands that pose uncertainty associated with maintaining a well-distributed spotted owl population.
3. *Climate Change* - Climatic changes resulting in wetter winters and springs can affect spotted owl reproductive output.
4. *Breeding Habitat Disturbance* - Disturbance from recreation activities may interfere with owl fitness and nesting success.
5. *Barred Owl* - Expansion of barred owls has resulted in the introduction of a generalist species into the range of the spotted owl, a specialist species. The barred owl is considered a competitor for nesting habitat with the spotted owl and can also hybridize with the spotted owl (Dark et al. 1998). No barred owls have been detected on the Stanislaus, but they do occur on the Eldorado National Forest to the north, and the Sequoia National Forest to the south.
6. *Disease* - The effect of West Nile virus on owl populations is uncertain at this time because the disease was only recently detected in Tuolumne County (summer 2004). Given the mortality rates in similar avian species that have contracted West Nile Virus, a high mortality rate could be expected in infected spotted owls.

Management Direction

Current management direction is defined by project-level standards and guidelines from the Forest Plan (USDA 2010) and is based on the desired future condition of land allocations (Robinson 1996). The spotted owl is a Region 5 Sensitive species associated with old forest ecosystems (USDA 2004). The following land allocations pertain to spotted owl and old forest ecosystems: Protected Activity Centers (PACs), Home Range Core area (HRCA), and Old Forest Emphasis Area (OFEA).

The desired condition for spotted owl Protected Activity Centers (PAC) is that stands in each PAC encompass about 300 acres of the highest quality breeding habitat available that includes: The desired

condition for spotted owl Protected Activity Centers (PAC) is to have 1) at least two tree canopy layers; (2) dominant and co-dominant trees with average diameters of at least 24 inches dbh; (3) at least 60 to70 percent canopy cover; (4) some very large snags (greater than 45 inches dbh); and (5) snag and down woody material levels that are higher than average.

The desired condition for Spotted Owl Home Range Core Area (HRCA) is to encompass the best available habitat in the closest proximity to the owl activity center (USDA 2004 ROD pp. 39-40). HRCAs consist of large habitat blocks that have: 1) at least two tree canopy layers; 2) at least 24 inches dbh in dominant and co-dominant trees; 3) a number of very large (greater than 45 inches dbh) old trees; 4) at least 50 to 70 percent canopy cover; and 5) higher than average levels of snags and down woody material.

The desired condition for Old Forest Emphasis Area (OFEA) is to provide habitat conditions for mature forest associates (spotted owl, northern goshawk, Pacific marten, and fisher). Specifically, forest structure and function across old forest emphasis areas generally resemble pre-settlement conditions.

High levels of horizontal and vertical diversity exist at the landscape-scale (roughly 10,000 acres). Stands are composed of roughly even-aged vegetation groups, varying in size, species composition, and structure. Individual vegetation groups range from less than 0.5 to more than 5 acres in size. Tree sizes range from seedlings to very large diameter trees. Species composition varies by elevation, site productivity, and related environmental factors. Multi-tiered canopies, particularly in older forests, provide vertical heterogeneity. Dead trees, both standing and fallen, meet habitat needs of old-forest-associated species. Figure 1 shows forest structure and function generally resemble pre-settlement conditions.

California Spotted Owl: Environmental Consequences

The project alternatives could result in direct and indirect effects to the California spotted owl through the following activities:

- Mechanical site prep for planting.
- Herbicide application for site prep and release of conifers.
- Planting and thinning conifers.

These actions may have direct and indirect effects on spotted owls through the following:

- Project related death, injury, or disturbance.
- Project related modifications to habitat quantity and/or quality.

Death, injury and disturbance

Death, injury, and disturbance are potential direct effects to consider for spotted owl (USDA 2004). Project activities have the potential to cause death or injury by tree-falling or by the use of heavy equipment. There is the potential for death or injury if nest trees are felled while being used by nesting birds during the reproductive season. The mobility of the species in question and the management requirement of LOPs, make it highly improbable that death or injury would occur as a result of project activities.

Project activities have the potential to cause disturbance mainly because of the use of loud machinery. Loud noise from equipment such as chain saws or tractors is expected to occur in reforestation and thinning units, project roads, and at landings. Loud noise has the potential to change normal behavior patterns during the period operations would take place and could potentially impair essential behavior patterns of the spotted owl related to breeding, feeding, or sheltering. The potential for disturbance to breeding owls is minimized by the implementation of Limited Operating Periods (LOPs) as a management requirement.

Habitat modification

California spotted owls are most closely associated with heterogeneous forests characterized by areas with large trees, large snags, and large down woody material (North et al. 2009, Roberts and North 2012, Keane 2014). They prefer forested stands with complex vertical and horizontal vegetative structure. Research from the past several decades continues to suggest that within their habitat matrix, spotted owls depend on "green" stands with the aforementioned characteristics for nesting, repeated roosting, and for foraging. Habitat loss and fragmentation are known to be risk factors affecting spotted owl persistence across their range in the Sierra Nevada (USFWS 2006c). Research indicates that successful territories (i.e., sustained survival and occupancy) have more than 300 acres of high quality forested habitat comprised of canopy cover greater than 70 percent (Draft Interim Recommendations for the Management of California Spotted Owl Habitat on National Forest System Lands, USDA 2015b). Additionally, territories with greater concentrations of forested habitat with canopy cover greater than 50 percent in close proximity to the nesting area exhibit higher occupancy rates and lower extinction rates (Ibid). Reestablishing forested habitat in close proximity to remaining green forest, increasing habitat availability and reducing fragmentation across the project area would improve territory and landscape level habitat conditions for spotted owls. Built in design criteria would promote heterogeneity when planting conifers. For example, up to 5 oaks per acre would receive a 25 foot radius buffer to provide ample growing space in the long-term. Up to 20 percent understory vegetative cover would be retained on a unit basis and would not be treated during site prep or release treatments. Other inoperable areas, such as steep pitches and sensitive plant sites would not be planted with conifers. These design criteria would break up the continuity of planted conifers, promote several open grown oaks per acres, and would provide understory vegetation throughout the treated areas. Active or managed reforestation is predicted to provide more complex habitat conditions in the long-term. For, example, active reforestation is expected to produce more large trees (e.g., $\geq$ 24" dbh) and higher levels of snag recruitment when compared to the No Action Alternative. Restoring fire to this landscape within ten years of planting treatments, as proposed under Alternatives 1 and 3, would contribute to stand and landscape heterogeneity and structure and promote resiliency across forested areas as described in the desired conditions for open canopy mosaic and old forest emphasis. Thinning new plantations, as proposed under Alternative 5, would contribute to achieving stand and landscape heterogeneity described as ICO in the desired condition for open canopy mosaic and old forest emphasis. Thinning existing plantations is also expected to accelerate growth rates and increase structural stand diversity, improving roosting, nesting, and foraging habitat conditions sooner than without thinning. Thinning these areas would also increase resilience when managed or wildfire returns to this landscape (Fuels, Chapter 3.05). Reforestation and thinning efforts would promote the viability of spotted owls across this landscape in the short and long-term.

Short-term, within the next ten years, snags and down woody material function as habitat elements important for owl prey. Snags also serve as potential hunting perch sites that may be utilized by foraging owls. Recent research indicates that prey species may be abundant and available in the post-fire environment. Work by Bond et al. (2009, 2013) indicates that owls may use high-severity fire areas for foraging and that foraging owls with burned forest in their home range appear to utilize a variety of prey, particularly gophers (*Thomomys spp*.) and flying squirrels (*Glaucomys sabrinus*). Bond et al. (2013) also found that wood rats (*Neotoma spp*.), sciurid squirrels (Family *Sciuridae*), and deer mice (*Peromyscus spp*.) were also represented as important prey items for owls within a post-fire habitat mosaic. Results from studies of small mammal habitat associations demonstrate the species-specific importance of habitat elements such as shrubs, downed logs, snags, and truffles (Keane 2014). The time elapsed since fire is closely correlated with habitat elements and the composition of prey species (Roberts 2008, Roberts and van Wagtendonk 2008). For example, post-fire habitats are typically rich in gophers and deer mice in the first decade following a fire, followed by wood rats when understory conditions are well developed in the first and following decades and finally by

sciurid squirrels and flying squirrels when trees reach maturity (Ingles 1965, Quinn and Keeley 2006). A diversity of prey species within a habitat mosaic can be expected to benefit predators such as the spotted owl (Roberts and North 2012). Retention of burned habitat within PACs and areas not proposed for reforestation would provide habitat for prey that may in turn benefit resident owls. While research (such as that currently underway in the Rim Fire area) will help better determine retention thresholds and spatial arrangements of snags compatible with owl use, snag retention of 12 to 30 square feet basal area per acre proposed under all action alternatives is likely to allow for an adequate number of perch sites for owl foraging within and adjacent to treatment units.

Long-term over several decades, large snags and large down logs are considered biological legacies in the post-fire environment and play important roles in the structure of the future forest (Lindenmayer et al. 2008). For example, large snags and large down logs are fundamental to the definition of old forest and are important attributes for the development of the old forest ecosystem and associated species such as the spotted owl. Snags may stand for decades and in time, may become future nest trees for spotted owl as the regenerating forest nears maturity, although few large snags may be expected to remain intact by that time. Snag dynamics in the Sierra Nevada are complex and snags fall at different rates depending on many factors (Cluck and Smith 2007). Once recruited into the down woody material on the ground, this coarse woody debris again serves as an important element in owl habitat (Verner et al. 1992). Thus, decaying wood serves different functional roles overtime, first providing cover for spotted owl prey in the complex early seral stage of the forest, and ultimately decaying and playing a critical role in soil development of old forests. For example, logs in decay class five (i.e. highly decayed) are associated with hypogenous fungi (i.e. truffles), which in turn serve as a primary food source for spotted owl prey in old forests - the flying squirrel in particular (Verner et al. 1992).

Spotted owls use habitat at multiple scales ranging from breeding territories that are several hundred acres, home ranges that are several thousand acres, to landscapes when considering population viability. Because they spotted owls focus their breeding activities in the best available habitat around roost and nest sites (Verner et al. 1992), habitat modification effects are expected to be most pronounced in PACs (at least 300 acres) and Home Range Core Areas (HRCAs) (700 acres adjacent to PACs).

Indicators

The following indicators were chosen to provide a relative measure of the direct and indirect effects to the spotted owl and to determine how well project alternatives comply with Forest Plan Direction.

1. Acres of future moderate and high capability habitat planted and thinned.
2. Toxicological effects from herbicide use.

These criteria were chosen based on the best available scientific literature which focuses on various aspects of spotted owl ecology and life history requirements. These criteria focus on those life history aspects, or habitat elements, considered most limiting to California spotted owl persistence across their range and where project effects are expected.

Alternatives 1, 3, and 5

Because there is little difference in the planting prescription and outcome in the short and long-term under these three alternatives, the effects are expected to be similar under these three alternatives and are analyzed together. The differences in herbicides proposed between Alternatives 1 and 5 versus Alternative 3 were separated below accordingly.

DIRECT AND INDIRECT EFFECTS

Indicator 1. *PACs:*

Reforestation (includes natural regeneration): Under Alternatives 1, 3, and 5, there are eight PACs where reforestation is proposed on about 98 acres where hazard trees were removed post Rim Fire; Ackerson Creek, Ackerson Mountain, MF Tuolumne, Cottonwood Creek, and Lower Skunk Creek. Table 3.16-8 displays the affected territories, proposed treatments, desired conditions, and associated acres; maps are available in the Terrestrial Wildlife BA/BE, Appendix A. There are no treatments proposed within 500 feet of current activity centers. Reforesting these areas would provide screening from the roads and restore the amount of interior habitat that was available to resident owls pre-fire. Because of the limited acreage involved in these treatments, minor benefits are expected for resident owls.

There are three PACs where reforestation is proposed on about 89 acres that burned at higher severity to enhance and protect sensitive plant habitat and Watchlist species of interest habitat; Femmons, South Fork Tuolumne, and Soldier Creek, Table 3.16-8. There are no treatments proposed within 500 feet of current activity centers. These areas are known to be occupied by these sensitive and unique plant species and local populations would benefit from proposed treatments (Sensitive Plants, Chapter 3.09). The Region 5 sensitive plants are Mountain ladyslipper and Goward's waterfan, and the botanical species of interest is madrone. Small fire killed trees less than 15" dbh would be removed to reduce fuel loading and increase safety for workers when planting conifers. All trees live and dead, greater than 15" dbh within these planting areas would be retained and would continue to provide perch, roost, and potential nest sites for owls. Oaks would be buffered similar to other planting prescriptions under these alternatives. All madrones would be buffered by 25 feet during planting. Owls are also expected to realize minor benefits from these proposed treatments. Most notably, increased within stand structure and diversity comprised of uneven aged forest.

Thinning: There is one PAC where thinning of existing plantations on about 68 acres is proposed; South Fork Tuolumne, Table 3.16-8. Three distinct plantations comprised of trees ranging in size from 10 to 20" dbh are located within this PAC. Thinning of plantations is designed to promote increased vertical and horizontal structure, release oaks, breaking up the continuity of vegetation and increasing resilience when fire returns. Thinning existing plantations in this PAC would increase the growth rate of remaining trees and promote understory herbaceous and woody vegetation recruitment. The expected increase in stand diversity coupled with snag retention would provide higher quality habitat for owls and important prey species such as mice and squirrels in the short-term.

3.16-8 Spotted owl PAC treatments, desired conditions, and associated acres

Spotted Owl PAC Name and ID	Reforestation[1]		Thin Existing Plantation	Grand Total
	Old Forest Mosaic	Open Canopy Mosaic	Old Forest Mosaic	
Soldier Crk - TUO0010	42	0	0	**42**
Ackerson Crk - TUO0012	0	17	0	**17**
SF Tuolumne - TUO0024	21	0	0	**21**
MF Spinning Wheel - TUO0025	0	0	68	**68**
Ackerson Mtn - TUO0039	0	16	0	**16**
MF Tuolumne - TUO0040	0	21	0	**21**
Femmons Meadow - TUO0072	26	0	0	**26**
Cottonwood Crk - TUO0149	0	27	0	**27**
Lower Skunk Creek - TUO0218	17	0	0	**17**
Total	**106**	**81**	**68**	**255**

[1] Includes natural regeneration

HRCAs:

Reforestation (includes natural regeneration): There are about 4,793 acres within 28 HRCAs proposed for reforestation. Table 3.16-9 displays the affected territories, proposed treatments, desired conditions, and associated acres. Planting areas adjacent to and near spotted owl activity centers as proposed under these alternatives would more quickly improve breeding habitat conditions for resident birds. The HRCA acres proposed for reforestation were mostly burned at high severity, reducing the amount of green forested habitat available in close proximity to the owl's activity centers.

Thinning: There are about 983 acres within 16 HRCAs proposed for thinning of existing plantations, Table 3.16-9. While some of these plantations are considered suitable because they are CWHR size class 4 or 5 and have greater than 40 percent canopy cover, they lack structural diversity. Thinning these plantations would promote vertical and horizontal diversity which in turn improves habitat capability. The goal is to open up these stands, creating a habitat mosaic with individual trees, clumps of trees, and openings. The ICO design would provide structural diversity where it does not currently exist. For example, the prescription calls for releasing oaks and retaining a diversity of species and sizes of residual trees. After thinning, remaining trees are expected to grow faster and understory vegetation would become established, improving habitat conditions for owls and their prey in the short and long-term. In addition, by breaking up the continuity of vegetation, the habitat would be more resilient when fire or other stochastic events occur.

Spotted owls are expected to benefit in the short and long-term from reforestation and thinning treatments. Reforestation and thinning as proposed under Alternatives 1, 3, and 5 would improve habitat conditions and increase the amount of moderate and high capability habitat available within these territories, moving them toward the desired condition outlined in the Draft Interim Recommendations for the Management of California Spotted Owl Habitat on National Forest System Lands (USDA 2015b).

Table 3.16-9 Spotted owl HRCA treatments, desired conditions, associated acres, and precent of HRCA proposed for treatment

HRCA Name and ID	Reforestation[1,2]		Thin[1]		Total Acres[1]	Percent of HRCA Treated[1]
	Old Forest Mosaic	Open Canopy Mosaic	Old Forest Mosaic	Open Canopy Mosaic		
Cherry Lake HRCA TUO0AAA	0	2	91	69	**163**	16
Mather HRCA TUO0BBB	52	163	3	2	**220**	20
Soldier Crk HRCA TUO0010	251	120	0	0	**371**	37
Big Crk HRCA TUO0011	87	65	0	36	**187**	18
Ackerson Crk HRCA TUO0012	5	58	0	0	**64**	6
SF Tuolumne HRCA TUO0024	239	234	0	0	**474**	47
MF Spinning Wheel HRCA TUO0025	56	148	71	75	**349**	35
Rush Creek HRCA TUO0026	112	104	0	0	**218**	22
North Bear Mtn HRCA TUO0027	150	152	0	21	**323**	26
Bear Mtn HRCA TUO0028	183	222	0	28	**432**	43
Reed Crk HRCA TUO0031	143	550	6	0	**699**	70
Ackerson Mtn HRCA TUO0039	47	58	0	0	**106**	10
MF Tuolumne HRCA TUO0040	52	163	3	2	**220**	20
Bear Spring Crk HRCA TUO0061	13	15	30	0	**58**	5
Spotted Owl HRCA TUO0065	0	4	0	37	**41**	4
Femmons Mdw HRCA TUO0072	44	48	0	0	**175**	17
Crocker Mdw HRCA TUO0078	18	53	0	3	**73**	5
Harden Flat NW HRCA TUO0085	129	272	0	0	**401**	39
Bear Crk HRCA TUO0145	0	18	0	71	**89**	9
Hunter Crk HRCA TUO0146	0	90	0	247	**337**	34
Cottonwood Crk HRCA TUO0149	0	135	0	84	**219**	22
Ascension Mdw W HRCA TUO0177	18	56	5	12	**90**	9
N Niagara HRCA TUO0205	0	18	0	16	**34**	3
L Skunk Crk HRCA TUO0218	386	153	0	0	**539**	5
U Cherry Lake HRCA TUO0219	17	0	57	6	**80**	8
Box Spring HRCA TUO0255	0	27	0	4	**31**	3

HRCA Name and ID	Reforestation[1,2]		Thin[1]		Total Acres[1]	Percent of HRCA Treated[1]
	Old Forest Mosaic	Open Canopy Mosaic	Old Forest Mosaic	Open Canopy Mosaic		
Spotted Owl HRCA TUO0257	0	33	0	0	**33**	3
Spotted Owl HRCA TUO0258	0	44	0	0	**44**	4
Total HRCA Acres By Treatment Type and Desired Condition	**1,950**	**2,844**	**263**	**720**	**5,777**	

[1] Includes PAC treatment acres
[2] Includes Natural Regeneration

Greater Landscape: Under these alternatives there are an additional 21,650 acres proposed for reforestation (reforestation and natural regeneration) across the project area. The reforestation treatments when combined with reforestation in PACs and HRCAs would increase the amount of moderate and high capability habitat available to owls on STF lands by 67 percent in the long-term. Under these alternatives there are an additional 13,000 acres of thinning existing plantations across the project area. The reforestation and thinning treatments proposed under these alternatives have the potential to benefit spotted owls at the landscape scale. These alternatives would result in the greatest increase of moderate and high capability forested habitat across this landscape. Because habitat loss and fragmentation have been identified as a significant risk to spotted owl persistence across their range, reestablishing forest habitat across the landscape is critical. Reduced fragmentation and increased availability of suitable habitat is expected to benefit resident and dispersing spotted owls.

Indicator 2. Under Alternatives 1 and 5, herbicide use is expected to have a limited potential for direct or indirect toxicological effects on spotted owls, as described under the herbicide risk assessment section. Because no herbicides are proposed under Alternative 3, there would be no exposure to herbicides and no direct, indirect, or cumulative toxicological effects to spotted owls under this alternative.

CUMULATIVE EFFECTS

The Forest queried its databases, including the Schedule of Proposed Actions (SOPA) to determine present and reasonably foreseeable future actions as well as present and reasonably foreseeable future actions on other public (non-Forest Service) and private lands (Appendix B, Rim Reforestation EIS). Some, but not all of these actions have or may contribute cumulatively to effects on spotted owls.

Relevant risk factors potentially affecting spotted owl abundance and distribution have been identified and primarily include habitat loss and fragmentation. Exposure to herbicides and potential toxicological effects associated with exposure were also identified as having the potential to affect spotted owls. The following evaluation criteria were used as relative measures of cumulative effects from Alternatives 1, 3, and 5: habitat modification. In addition, toxicological effects were used as evaluation criteria for Alternatives 1 and 5.

Habitat Modification

Federal Lands: Present and foreseeable future activities on federal lands include: Funky Stewardship, Groovy Stewardship, Reynolds Creek Stewardship, Soldier Creek Timber Sale, Campy Timber Sale, Looney Timber Sale, Thommy Timber Sale, which are green thinning projects treating 6,546 acres of green forest across the analysis area. All snags and many declining trees will be retained unless they pose a safety hazard in these projects. The snag and declining tree retention will provide snags that could serve as potential roost or nest sites for spotted owls in the short-term as well as recruits for future nest sites in the long-term. Other federal activities potentially impacting breeding habitat for spotted owls is fuels reduction associated with the Rim Recovery project. Fuels reduction associated with this project will reduce the risk of further loss of remaining green forest within the project area.

Toxicological effects

Federal lands: There is one present federal action of herbicide use on 0.5 acres under the Rim Fire Rehabilitation project and two foreseeable federal actions of herbicide use: 8 acres under the Twomile Ecological Restoration Noxious Weed project and 23 acres associated with a special use permit for the Reliable Power Project to control vegetation under powerlines. There are no other present or foreseeable future federal actions related to herbicide use.

Private lands: Herbicide use is proposed on 1,583 acres of private land within the project area in 2017. No other present or foreseeable future actions are proposed on private lands related to herbicide application.

Alternatives 1, 3, and 5 contribution/summary: Alternatives 1, 3, and 5 would contribute cumulatively to short and long-term effects to California spotted owls. Under these alternatives, reforestation on about 26,400 acres would increase the amount of moderate and high capability habitat available across the analysis area by 38 percent in the long-term. Thinning about 14,000 acres of existing plantation is also expected to benefit spotted owls. These alternatives would result in similar benefits with respect to existing plantation thinning when compared to Alternative 4 because the thinning prescription is the same under all action alternatives. However, under Alternatives 1, 3, and 5, the reforestation treatments would complement the thinning to improve habitat conditions across the landscape. Alternatives 1 and 5 would contribute to the short-term limited potential of exposure to toxicity from herbicide use. Alternatives 1, 3, and 5 would result in the greatest increase in available habitat and connectivity at the territory and landscape scale when compared to Alternatives 2 and 4. The cumulative contribution under this alternative is expected to benefit resident and dispersing California spotted owls and may beneficially affect the viability of this species.

Alternative 2

DIRECT AND INDIRECT EFFECTS

Indicator 1. Under No Action, death, injury or disturbance would not be an issue because no active management would occur.

The indirect effects of no action are primarily related to the influence no action may have on the amount of moderate and high capability habitat available, the restoration of habitat connectivity across the landscape, and how that may impact California spotted owls in the long-term. Under this alternative, about 9,800 acres of forested habitat is predicted to develop naturally with no active management across the landscape. This would increase habitat availability across STF lands by 25 percent, almost 42% less than that expected under Alternatives 1, 3, and 5. Because no active management would occur, it is unknown where naturally regenerating forest would occur and what benefits that would provide spotted owls. It is likely that areas in close proximity to live trees (i.e. seed source) would experience forest expansion to a limited degree, depending on the competing vegetation in the localized area. It should be noted that natural conifer expansion is sporadic in nature, could be delayed for decades due to shrub suppression, would likely be dominated by fir, and would not result in significant gains in forested habitat (Vegetation, Chapter 3.13). Areas far from seed sources would likely persist as chaparral for decades if not well over a hundred years. Existing plantations would not be thinned under this alternative; therefore, increasing structural diversity and improving habitat quality in these areas would not be realized. The plantations, if left untreated, could be at greater risk of loss when fire returns to this landscape because of the tightly spaced live trees and fuel loading from fire mortality (Fuels, Chapter 3.05).

Indicator 2. Because no herbicides are proposed under Alternative 2, there would be no exposure to herbicides and no direct, indirect, or cumulative toxicological effects to spotted owls under this alternative.

CUMULATIVE EFFECTS

The cumulative effects discussion under Alternatives 1, 3, and 5 outlines those present and foreseeable future activities scheduled on public and private lands.

Alternative 2 Contribution/Summary: Under Alternative 2, no direct cumulative effect is expected because no active management would occur, however, there may be indirect consequences under this alternative primarily related to the influence no action may have on future forest development and how that may impact California spotted owls. At the landscape scale, the cumulative contribution under this alternative would increase the available suitable habitat by 14 percent (9,800 acres) compared to a 38 percent increase (26,400 acres) under Alternatives 1, 3, and 5. It is unknown where and how long it would take natural regeneration to occur and what, if any, benefits would be realized by spotted owls at the territory or landscape level. The cumulative contribution under this alternative may negatively affect individuals and would not beneficially affect the viability of this species.

Alternative 4

DIRECT AND INDIRECT EFFECTS

Indicator 1. *PACs:*

Reforestation (includes natural regeneration): Under Alternative 4, there are five PACs with up to 23 acres proposed for reforestation. Effects from these limited proposed treatments are not measureable and are considered negligible or discountable.

Thinning: There is one PAC where thinning of existing plantations on about 68 acres is proposed; South Fork Tuolumne. The thinning prescriptions and expected benefits are the same as those discussed under Alternatives 1, 3, and 5.

HRCAs:

Reforestation (includes natural regeneration): There are about 820 acres within 14 HRCAs proposed for reforestation. This is about 4,000 acres less than Alternatives 1, 3, and 5. Table 3.16-10 displays the affected territories, proposed treatments, desired conditions, and associated acres. The planting prescription under this alternative is termed founder stands. This prescription calls for small variable shaped planting areas ranging from two to ten acres in size within a larger unplanted area. The unplanted area would likely be comprised of chaparral with scattered oaks. The planted area is only 20 percent of a given unit. Herbicides would be used to control shrubs and competing vegetation within planted areas and incorporating a 25 to 50 foot buffer around planted areas. These trees would be planted with a much tighter spacing, groups of 5 trees spaced 6 feet from each other. With the tighter spacing of planted trees, it may be necessary to thin the plantations around year 7 to allow growing space for the trees to mature. Prescribed fire or hand tools would be used to thin the new plantations. Prescribed fire would be applied to 50 percent of planted areas within ten years and the other 50 percent within 20 years. Reforesting in this manner would result in several small fragmented patches of forested habitat no bigger than ten acres separated by large tracts of chaparral. Small patches of forested habitat covering 20 percent of a given area would not provide the moderate and high capability habitat required by breeding spotted owls, which include large areas of contiguous forest. Similar to the No Action Alternative, about 9,800 acres of forested habitat is predicted to develop naturally with no active management across the landscape. Because no active management would occur on these acres, it is unknown where naturally regenerating forest would occur and what benefits it would provide for spotted owls. It is likely that areas in close proximity to live trees (i.e. seed source) would experience forest expansion to a limited degree, depending on the competing vegetation in the localized area. As stated under the No Action Alternative, natural conifer expansion is sporadic, could be delayed for decades due to shrub suppression, would likely be dominated by fir, and would not result in significant gains in forested habitat (Vegetation, Chapter 3.13). Areas far from seed sources would likely persist as chaparral for decades if not well over a hundred years. While this

alternative would increase the amount of forested habitat across STF lands by up to 25 percent, it is unknown how fragmented or contiguous the distribution would be across the landscape and if it would provide benefits to spotted owls at the territory or landscape scale.

Thinning: There are about 973 acres within 16 HRCAs proposed for thinning of existing plantations. Because the prescription for thinning is the same for all action alternatives, benefits are expected to be the same as discussed under Alternatives 1, 3, and 5.

Spotted owls are expected to benefit in the short and long-term from thinning treatments. Reforestation as proposed under Alternative 4, small isolated patches of forest no larger than ten acres in size, is not likely to improve habitat conditions or increase the amount of moderate and high capability habitat available within these territories. It is unknown if spotted owls would benefit from natural regeneration, but it is expected to take much longer for suitable breeding habitat to develop across these territories under this Alternative.

Table 3.16-10 Spotted owl HRCA treatments, desired conditions, associated acres, and precent of HRCA proposed for treatment

HRCA Name and ID	Reforestation[1]		Thin[1]		Total Acres[1]	Percent of HRCA Treated[1]
	Old Forest Mosaic	Open Canopy Mosaic	Old Forest Mosaic	Open Canopy Mosaic		
Cherry Lake HRCA TUO0AAA	0	0	91	69	**161**	16
Soldier Crk HRCA TUO0010	89	24	0	0	**113**	11
Big Crk HRCA TUO0011	40	5	0	36	**80**	8
SF Tuolumne HRCA TUO0024	98	48	0	0	**148**	15
MF Spinning Wheel HRCA TUO0025	12	21	71	75	**178**	18
Rush Creek HRCA TUO0026	16	30	0	0	**46**	5
North Bear Mtn HRCA TUO0027	24	12	0	21	**57**	6
Bear Mtn HRCA TUO0028	38	42	0	28	**109**	12
Reed Crk HRCA TUO0031	15	98	6	0	**119**	12
MF Tuolumne HRCA TUO0040	4	16	3	2	**25**	2
Bear Spring Crk HRCA TUO0061	3	10	30	0	**42**	7
Spotted Owl HRCA TUO0065	0	0	0	37	**37**	8
Bear Crk HRCA TUO0145	0	0	0	71	**71**	16
Hunter Crk HRCA TUO0146	0	0	0	247	**247**	25
Cottonwood Crk HRCA TUO0149	0	0	0	84	**84**	18
Ascension Mdw W HRCA TUO0177	17	6	5	12	**41**	6
N Niagara HRCA TUO0205	0	0	0	16	**16**	11

HRCA Name and ID	Reforestation[1]		Thin[1]		Total Acres[1]	Percent of HRCA Treated[1]
	Old Forest Mosaic	Open Canopy Mosaic	Old Forest Mosaic	Open Canopy Mosaic		
Lower Skunk Crk HRCA TUO0218	70	25	0	0	**95**	9
U Cherry Lake TUO0219	0	0	57	6	**63**	6
Box Spring HRCA TUO0255	0	28	0	4	**32**	3
Westside West HRCA TUO0258	0	28	0	0	**28**	3
Total HRCA Acres by Treatment Type and Desired Condition	**426**	**394**	**263**	**709**	**1792**	

[1]Includes PAC treatment acres
[2]Includes Natural Regeneration

Greater Landscape: Under this alternative there are an additional 2,107 acres proposed for reforestation (reforestation and natural regeneration) across the project area. These treatments are not likely to benefit spotted owls because reforestation would result in small fragmented patches of forest no larger than ten acres in size separated by large tracts of chaparral. There are about 13,000 additional acre of existing plantation proposed for thinning. These thinning treatments are likely to benefit spotted owls in the short and long-term. This alternative would result in the least amount of moderate and high capability forested habitat and the lowest reduction in habitat fragmentation when compared to Alternatives 1, 3, and 5.

Indicator 2. Herbicide use is expected to have a limited potential for direct or indirect toxicological effects on spotted owls, as described under the herbicide risk assessment section.

CUMULATIVE EFFECTS

The cumulative effects discussion under Alternatives 1, 3, and 5 outlines those present and foreseeable future activities scheduled on public and private lands.

Alternative 4 Contribution/Summary: Alternative 4 would contribute cumulatively to short and long-term effects to spotted owls. Under this alternative, reforestation on up to 2,950 acres in discreet patches no larger than ten acres is not expected to result in benefits to spotted owls. Natural forest recovery under this alternative is expected to increase available habitat by up to 14 percent across the analysis area. However, this natural forest recovery is expected to be sporadic, delayed, and a limited contribution to moderate and high capability habitat in the long-term. The founder stands prescription is not expected to provide moderate and high capability habitat because it would be located in small fragmented patches separated by large tracts of chaparral. Under this alternative about 14,000 acres of existing plantation would be thinned, promoting structural diversity and improving habitat capability in the short and long-term. This alternative would result in similar benefits with respect to existing plantation thinning when compared to Alternatives 1, 3, and 5 because the thinning prescription is the same under all action alternatives. Alternative 4 would contribute to the short-term limited potential of exposure to toxicity from herbicide use. The cumulative contribution under this alternative is expected to provide limited benefits to resident or dispersing spotted owls and would not beneficially affect the viability of this species.

California Spotted Owl: Summary of Effects

Indicator 1. Table 3.16-11 shows the number of acres proposed for reforestation (planting) and the number of acres of existing plantation proposed for thinning at the PAC, HRCA, and landscape scales. Alternatives 1, 3, and 5 would provide the greatest amount of moderate and high capability

habitat for spotted owls in the long-term when compared to Alternative 4. All action alternatives would result in the same amount of future moderate and high capability habitat within the treated existing plantations; however, Alternative 4 does not complement the existing plantation treatments by accelerating forest reestablishment in adjacent areas or across the landscape as proposed under Alternatives 1, 3, and 5.

Table 3.16-11 California Spotted Owl Summary of Effects

Indicator	Metric	Alternative				
		1	2	3	4	5
1. Future moderate to high capability habitat (planted or thinned)	Acres reforested in PACs[1]	187	0	187	23	187
	Acres reforested in HRCAs[1]	4,793	0	4,793	820	4,793
	Acres reforested (landscape)[1]	21,650	0	21,650	2,107	21,650
	Total acres	**26,630**	**0**	**26,630**	**2,950**	**26,630**
	Acres of existing plantation thinned in PACs	68	0	68	68	68
	Acres of existing plantation thinned in HRCAs	983	0	983	983	983
	Acres of existing plantation thinned (landscape)	13,000	0	13,000	13,000	13,000
	Total acres	**14,051**	**0**	**14,051**	**14,051**	**14,051**

[1] Includes natural regeneration

Indicator 2. Herbicide use under Alternatives 1, 4, and 5 are expected to have limited potential for direct or indirect toxicological effects on spotted owls. Because Alternative 4 has fewer acres of herbicide application proposed, the potential for effects would be less than under Alternatives 1 and 5. However, it is important to note that the toxicity exposure scenarios analyzed in the risk assessment show that all HQs are several orders of magnitude less than the NOAEL threshold of concern or No Observable Adverse Effect Level; therefore, spotted owls are provided an adequate margin of safety in the event that they are exposed to contaminated prey or water.

Determination of Effects

ALTERNATIVES 1 AND 5

It is my determination that Alternatives 1 and 5 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the California spotted owl. My determination is based on the following rationale:

- These alternatives include actions to reestablish contiguous forested habitat, accelerating the time in which these areas would be suitable for nesting, roosting, and foraging.
- These alternatives include actions to thin existing plantations, accelerating the time in which these areas would be suitable for nesting, roosting, and foraging.
- Habitat connectivity would be restored under these alternatives.
- Snag retention in close proximity to green forest would result in maintaining roosting and nesting structures as well as habitat for prey throughout the treated areas.
- These alternatives require the use of LOPs to reduce disturbance potential to breeding spotted owls.
- These alternatives provide for surveys to establish or confirm the location of activity centers and boundaries.
- Toxicity exposure levels from herbicide use under these alternatives are all several orders of magnitude below the Forest Service established threshold of concern.

ALTERNATIVE 2

It is my determination that Alternative 2 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the California spotted owl. My determination is based on the following rationale:

- This alternative would result in the smallest increase in moderate to high capability habitat available to spotted owls in the long-term.
- The structural diversity of existing plantations would not be promoted and thus habitat quality would not be improved in the short or long-term.
- Existing plantations may be at greater risk of loss when fire returns to this landscape.
- There would be no potential for exposure to herbicides.

ALTERNATIVE 3

It is my determination that Alternative 3 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the California spotted owl. My determination is based on the following rationale:

- This alternative includes actions to reestablish contiguous forested habitat, accelerating the time in which these areas would be suitable for nesting, roosting, and foraging.
- This alternative includes actions to thin existing plantations, accelerating the time in which these areas would be suitable for nesting, roosting, and foraging.
- Habitat connectivity would be restored under this alternative.
- Snag retention in close proximity to green forest would result in maintaining roosting and nesting structures as well as habitat for prey throughout the treated areas.
- This alternative requires the use of LOPs to reduce disturbance potential to breeding spotted owls.
- This alternative provides for surveys to establish or confirm the location of activity centers and boundaries.
- There would be no potential for exposure to herbicides.

ALTERNATIVE 4

It is my determination that Alternative 4 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the California spotted owl. My determination is based on the following rationale:

- This alternative includes actions to establish small fragmented patches of forest that would not provide suitable nesting or roosting habitat.
- This alternative includes actions to thin existing plantations, accelerating the time in which these areas would be suitable for nesting, roosting, and foraging.
- Snag retention in close proximity to green forest would result in maintaining roosting and nesting structures as well as habitat for prey throughout the treated areas.
- This alternative requires the use of LOPs to reduce disturbance potential to breeding spotted owls.
- This alternative provides for surveys to establish or confirm the location of activity centers and boundaries.
- Toxicity exposure levels from herbicide use under this alternative are all several orders of magnitude below the Forest Service established threshold of concern.

California Spotted Owl: Compliance with Forest Plan Direction

Applicable Forest Plan Direction

USDA 2010 p. 43: Assess the potential impact of projects on the connectivity of habitat for old forest associated species.

USDA 2010 p. 44: General guidelines for large-snag retention are as follows: 1) in westside mixed conifer and ponderosa pine types - four of the largest snags per acre.

USDA 2010 p. 186 and November 15, 2006 Regional Forester Guidance Letter on Limited Operating Periods for the California Spotted Owl: Maintain a limited operating period (LOP), prohibiting vegetation treatments within approximately ¼ mile of the activity center during the breeding season (March 1 through August 31), unless surveys confirm that California spotted owls are not nesting. Prior to implementing activities within or adjacent to a California spotted owl PAC and the location of the nest site or activity center is uncertain, conduct surveys to establish or confirm the location of the nest or activity center.

USDA 2010 p. 185: Manage PACs for higher than average levels of snags and down woody material.

USDA 2010 p. 189: Manage HRCAs for higher than average levels of snags and down woody material.

Forest Plan Compliance

THE ACTION ALTERNATIVES 1, 3, 4 AND 5 DEMONSTRATE FOREST PLAN COMPLIANCE THROUGH THE FOLLOWING

Alternatives 1, 3, and 5 address and propose actions to increase habitat connectivity.

Alternative 4 does not consider or address habitat connectivity.

Alternative 1, 3, 4, and 5 manage for the minimum levels of snags within General Forest, per guidelines in forest plan direction.

Alternatives 1, 3, 4, and 5 manage for higher than average levels of snags and down woody material within PACs, Old Forest Emphasis, and Home Range Core Areas, the land allocations managed for old forest objectives.

Alternatives 1, 3, 4, and 5 apply LOPs as required.

California Spotted Owl: Consistency with Draft Interim Recommendations for the Management of California Spotted Owl Habitat on NFS Lands

Region 5 is in the process of developing a new conservation strategy for the California spotted owl throughout its range in California. The Conservation Assessment will be completed in mid-2015, and it is intended to serve as the primary scientific foundation for the Conservation Strategy, which Region 5 anticipates to be completed by March 31, 2016. In the intervening time period, the Region asked the leading experts in the California spotted owl, forest ecology, and fire ecology in the Sierra Nevada associated with the Conservation Assessment to provide interim recommendations on changes to forest management prior to the development of the Conservation Strategy.

Conservation Measures

1a. Recommend habitat conservation for California spotted owls be addressed at four scales – activity center, territory, home range, and landscape.

2b. Recommend target canopy cover conditions for PAC habitat be set specifically at ≥ 70%. Further, we recommend that all snags, 15 inches and above, be retained in PACs, unless they represent a safety hazard.

3d. Designated habitat patches or stands ideally are large enough to provide interior stand conditions (1-2 tree heights from edge) to minimize edge effects, particularly for the acres with > 70% canopy cover.

4d. Desired conditions for a 1000-ac territory:

- ≥ 40% (400 ac) with >70% canopy cover (or best available – see recommendation 3b)

- Additional minimum of 300 acres (30%) with > 50% canopy cover
- The remaining area (< 300 acres) should represent fine-scale mosaic (gaps and patches of 0.03-

2.0 acres) of low, moderate, and high canopy cover that create heterogeneous conditions, that are in turn conducive to supporting suitable foraging habitat and an abundance of prey

- The condition of the territory is a function of all lands that occur within the territory.

5d. Recommend area outside the territory circle and within any given home range area be managed to maintain an average of 40% canopy cover across the entire home range area (not at the stand scale), with conditions ranging from < 25% to > 70% canopy cover across a fine-scale mosaic of heterogeneous conditions. The average condition is intended to serve as a guide in balancing a wide range of stand-scale canopy cover conditions across the home range area toward creating heterogeneous forest conditions.

Interim Guidance Consistency

THE ACTION ALTERNATIVES 1, 3, 4 AND 5 DEMONSTRATE INTERIM RECOMMENDATION CONSISTENCY THROUGH THE FOLLOWING

Alternatives 1, 3, 4, and 5 address spotted owl habitat conservation at the activity center, territory, and landscape scale.

Alternatives 1, 3, and 5 retain all snags greater than 15" dbh within PACs, unless they represent a safety hazard.

Alternatives 1, 3, and 5 would provide habitat patches and stands that provide interior stand conditions to minimize edge effects.

Alternative 4 would not consistently provide interior habitat patches or stands in close proximity to each other. The fragmented nature of the founder stands would likely present a barrier to spotted owl use of small forested patches and movement across non-forested areas to reach other small forested patches.

Alternatives 1, 3, and 5 address and propose actions to move territories and home ranges toward the desired conditions identified in the interim recommendations in the long-term, specifically conservation measures 3d and 4d..

Alternative 4 does not address or proposed actions to address conservation measures 3d or 4d.

Northern Goshawk: Affected Environment

Species and Habitat Account

The northern goshawk (*Accipiter gentilis*) is a Region 5 Forest Service Sensitive species and is also listed with the State of California as a Species of Special Concern. Northern goshawks occur throughout North America and into Mexico. They occur throughout the Sierra Nevada year round and breed from about 2,400 feet to the crest as well as on the east side of the Sierra. On the west slope, they use a wide range of habitat types and are considered year round residents (USDA 2001).

Population trend of goshawks in California are poorly known. Distributional changes and loss of breeding territories from timber harvest and wildfire across their range suggest the population size has been reduced (Shuford and Gardali 2008). Ongoing concern that populations and reproduction may be declining in California due to changes in the amount and distribution of habitat has been documented (USDA 2001). Bloom and others (1986) estimated a statewide population of approximately 1,300 breeding territory records on public and private lands. Recent synthesis of existing breeding territory records documented approximately 1,000 known territories statewide

between 1970 and 2001 (J. Keane and B. Woodbridge unpubl. data). As of 2014, there are 93 documented goshawk territories on the STF.

Northern goshawk sites are identified through the use of protocol surveys (USDA 2000). Protocol surveys for goshawk have been conducted throughout the Rim Fire area for the past two decades. These surveys are best described as opportunistic depending upon planned activities and funding levels but have occurred at a level such that inventory information for the analysis area is considered essentially complete (USDA 2015a). Surveys were conducted in 2014 and 2015, resulting in the addition of one new territory discovered in 2014.

The project area is within the current distribution of northern goshawks across the Sierra Nevada Bioregion. There are currently 21 territories within the action area. LOPs would be placed around all documented goshawk PACs from February 15-September 15 of any given year during project implementation.

General habitat requirements for northern goshawks include forested environments with high canopy cover (i.e. greater than 40 percent) that feature vegetation types such as Montane Hardwood, Montane Hardwood Conifer, Ponderosa and Jeffrey Pine, Sierran Mixed Conifer, Lodgepole Pine and Red Fir (CDFW 2008). Moderate to High Capability habitat is defined as that in which a CWHR suitability rating is ≥ 0.55. Two of three categories (reproduction, cover, food) must have a medium rating to achieve the minimum rating. Reference CWHR version 8.2 users' manual for further explanation on suitability ratings (CDFW 2008). Acres include National Forest system lands only. There are about 42,800 acres of moderate and high capability habitat on NFS lands only. The remaining suitable habitat was fragmented by the Rim Fire. It is unknown to what extent this fragmentation has reduced the ability of goshawks to move between and utilize disjunct patches of habitat because they utilize a broad variety of habitats and have such large home ranges. There are about 75,800 acres of moderate and high capability habitat within the cumulative effects analysis area.

Goshawks typically nest in areas with a high density of large trees, high canopy cover, high basal area, and gentle to moderate slopes (Reynolds et al. 1992, USDA 2001). Breeding typically occurs in late winter to spring and is dependent on elevation and weather conditions. Nest sites are the focal point of goshawk breeding territories and are described by Keane (1999) and Maurer (2000):

- High canopy cover (average 65 to 70 percent)
- Greater number of large, live trees between 24 to 39 inches dbh (average 22 per acre).
- Greater number of large, live trees greater than 24 inches dbh (about 33 to 38 per acre).
- Open understory with low average shrub and sapling cover (about 9.9 percent).
- Low average numbers of small trees in the understory (less than 121 trees per acre and less than 226 trees per acre between 2 to 12 inches dbh).

Goshawks construct stick nests in live conifer, hardwood trees or snags. These nests are typically built in the lower portion of the canopy in a fork or crook of a tree, and occasionally next to the bole (3 to 10 feet) on a large branch (USDA 2001). Nest trees are reported to be among the largest trees in a stand (Ibid). Data from the Stanislaus National Forest show trees or snags ranging from 14 to 65 inches dbh have been selected as nest trees. Goshawks typically build more than one nest, placing alternates in adjacent trees or up to a half mile away (Reynolds et al. 1992). Annual variation in reproduction can be influenced by prey abundance, late winter and early spring temperature (Keane 1999).

Northern goshawks hunt on the wing, from elevated perches, and on the ground. They feed on a variety of birds and mammals such as Steller's jays, flickers, Douglas squirrels, and chipmunks (Ibid). The presence of structural elements such as snags and large downed woody debris provide important habitat for many prey species utilized by goshawks (Reynolds et al. 1992). Foraging habitat preferences of goshawks are poorly understood, although limited information from studies in conifer

forests indicates they prefer to forage in mature forests with greater canopy closure and greater density of large trees greater than 40 inches dbh (Bright-Smith and Mannan 1994, Hargis et al. 1994). Reynolds et al. (1992) suggest that goshawks prefer relatively open shrub and lower canopy layers within forested stands, which may facilitate prey detection and capture.

Both natal and breeding dispersal are not well understood in northern goshawks due, in part, to the complexity of variables associated with dispersal, including the long distances that this species can disperse. Maximum natal dispersal distances in goshawks on the Kern Plateau were reported to range from 1.7 to 49 miles (Weins et al. 2006). One banded individual from this study was recovered 275 miles beyond the study area, indicating that dispersal distances are highly variable. Local recruits with short dispersal distances have been reported to establish breeding territories within three to five territories from their natal area (Ibid).

Nonbreeding period home ranges average about 20,300 acres for males and about13,800 acres for females (USDA 2001). Breeding period home ranges average about 6,700 acres for males and about 5,000 acres for females (Ibid). Adult's exhibit site fidelity once breeding territories have been established. Breeding dispersal does occur and has been reported at distances of about three to six miles for females and about two to four miles for males in Arizona and California (Reynolds and Joy 1998, Woodbridge and Detrich 1994). This species is not considered migratory, though limited altitudinal movements likely occur during winter months (USDA 2001).

Stand replacing fire events have eliminated nesting territories but goshawks are known to nest in stands that have experienced understory fires that did not reduce canopy cover and numbers of large trees below suitable levels (USDA 2001).

Risk Factors

Bloom et al. (1986), Keane and Morrison (1994), Kennedy (1997), Squires and Reynolds (1997), Smallwood (1998), and USDA (2001) summarize risk factors potentially influencing the abundance and distribution of northern goshawks:

1. *Loss of Breeding Habitat* - The major threat to goshawks are loss of breeding habitat from wildfire and the effects of vegetation management (timber harvest, fuels treatments, etc.).
2. *Breeding Site Disturbance* - Breeding site disturbance from vegetation treatments, human recreation, and falconry harvest can negatively affect individuals and potentially local populations.
3. *Chemical pollutants* - Investigation of the potential risk of pollutants on this species, such as rodenticides and pesticides, is needed.
4. *Climate* - Weather and prey dynamics are primary factors affecting northern goshawk reproduction, and potential survival. Climatic changes resulting in wetter winters and springs can affect northern goshawk demography.

Management Direction

Current management direction is defined by project-level standards and guidelines from the Forest Plan (USDA 2010) and is based on the desired future condition of land allocations (Robinson 1996). The northern goshawk is a Region 5 Sensitive species associated with old forest ecosystems (USDA 2004). The following land allocations pertain to goshawk and old forest ecosystems: Goshawk Protected Activity Centers (PACs), spotted owl Home Range Core area (HRCA), and Old Forest Emphasis Area (OFEA). Although goshawks occupy a broad ecological niche and utilize a variety of habitats, the desired conditions in areas managed for old forest objectives provide suitable habitat for goshawk nesting, post-fledging use, and are preferentially selected for foraging (USDA 2004).

The desired condition for goshawk Protected Activity Centers (PAC) is that stands in each PAC encompass about 200 acres of the highest quality breeding habitat available that includes: (1) at least two tree canopy layers; (2) dominant and co-dominant trees with average diameters of at least 24

inches dbh; (3) at least 60 to70 percent canopy cover; (4) some very large snags (greater than 45 inches dbh); and (5) snag and down woody material levels that are higher than average.

Desired conditions in Home Range Core Area (HRCA) for spotted owls also provide suitable habitat conditions for goshawk. The desired condition for HRCA is for large habitat blocks that have: 1) at least two tree canopy layers; 2) at least 24 inches dbh in dominant and co-dominant trees; 3) a number of very large (greater than 45 inches dbh) old trees; 4) at least 50 to 70 percent canopy cover; and 5) higher than average levels of snags and down woody material.

The desired condition for Old Forest Emphasis Area (OFEA) is to provide habitat conditions for mature forest associates (northern goshawk, spotted owl, Pacific marten, and fisher). Specifically, forest structure and function across old forest emphasis areas generally resemble pre-settlement conditions.

High levels of horizontal and vertical diversity exist at the landscape-scale (roughly 10,000 acres). Stands are composed of roughly even-aged vegetation groups, varying in size, species composition, and structure. Individual vegetation groups range from less than 0.5 to more than 5 acres in size. Tree sizes range from seedlings to very large diameter trees. Species composition varies by elevation, site productivity, and related environmental factors. Multi-tiered canopies, particularly in older forests, provide vertical heterogeneity. Dead trees, both standing and fallen, meet habitat needs of old-forest-associated species. Forest structure and function generally resemble pre-settlement conditions (Figure 1).

Northern Goshawk: Environmental Consequences

The project alternatives could result in direct and indirect effects to the northern goshawk through the following activities:

- Mechanical site prep for planting.
- Herbicide application for site prep and release of conifers.
- Planting and thinning conifers.

These actions may have direct and indirect effects on northern goshawks through the following:

- Project related death, injury, or disturbance.
- Project related modifications to habitat quantity and/or quality.

Death, injury and disturbance

Death, injury, and disturbance are potential direct effects to consider for northern goshawk (USDA 2004). Project activities have the potential to cause death or injury by tree-falling or by the use of heavy equipment. There is the potential for death or injury if nest trees are felled while being used by nesting birds during the reproductive season. The mobility of the species in question and the management requirement of LOPs, make it highly improbable that death or injury would occur as a result of project activities.

Goshawks are highly susceptible to human disturbance (Squires and Reynolds 1997). During courtship and nest building, goshawks have been recorded to abandon nest areas following human intrusion alone (USDA 2000). In addition, incubating or brooding females may interrupt incubation or nestling care for extended periods to defend a nest (Ibid).

Logging activities near nests can cause failure, especially during incubation (Boal and Mannan 1994). Using heavy equipment too close to active nests can cause abandonment, even with 20 day-old nestlings present (Squires and Reynolds 1997). Loud noise from equipment such as chain saws or tractors is expected to occur in reforestation and thinning units. Human presence, particularly loud noise, has the potential to change normal behavior and potentially impair essential behavior patterns of the northern goshawk related to breeding, feeding, or sheltering. The potential for disturbance is

minimized by the implementation of Limited Operating Periods (LOPs) as a management requirement.

The location of nest sites or activity centers are more uncertain following large-scale disturbance events (Keane, pers. comm.); conducting surveys to establish or confirm any new locations of nests or activity centers is a way to address this movement uncertainty (USDA 2000). Conducting protocol surveys is a management requirement common to all action alternatives.

Habitat modification

Woodbridge and Detrich (1994) found that northern goshawk territories associated with large contiguous forest patches were more consistently occupied compared to highly fragmented stands. Forested habitat is required by goshawks for roosting, nesting, and foraging (Bright-Smith and Mannan 1994, Hargis et al. 1994, Reynolds et al. 1992, USDA 2001). Loss of breeding habitat from wildfire is known to be a risk factor affecting goshawk persistence in any given landscape. Reestablishing forested habitat in close proximity to remaining green forest, increasing habitat availability and reducing fragmentation across the project area would improve territory and landscape level habitat conditions for goshawks. Thinning existing plantations is also expected to accelerate growth rates and increase structural stand diversity, improving roosting, nesting, and foraging habitat conditions sooner than without thinning. Thinning these areas would also increase resilience when managed or wildfire returns to this landscape (Fuels, Chapter 3.05). Reforestation and thinning efforts would promote the viability of goshawks across this landscape long-term.

Retention of snags and large downed woody debris is proposed under all action alternatives. Short-term, within the next ten years, snags and down woody material function as habitat elements important for goshawk prey. Snags also serve as potential hunting perch sites that may be utilized by goshawks. Goshawks feed on a variety of prey present in post-fire habitat mosaics. Primary prey groups include tree and ground squirrels, cottontails, jackrabbits, hares, and medium and large sized birds (Squires and Reynolds 1997). In the Sierra Nevada primary prey species are Douglas squirrel, golden- mantled ground squirrel, chipmunks, Steller's jay, northern flicker, and American robin (Keane 1999).

Long-term over several decades, large snags and large down woody material are considered biological legacies in the post-fire environment and play important roles in the structure of the future forest (Lindenmayer et al. 2008). Snag dynamics in the Sierra Nevada are complex and snags fall at different rates depending on many factors (Cluck and Smith 2007). The time elapsed since fire is closely correlated with habitat elements present and the composition of prey species (Ingles 1965, Quinn and Keeley 2006). Ground squirrels, northern flickers, and the American robin use a variety of open forests and shrub habitats with abundant insects and fruits (USDA 2001). Douglas squirrels use intermediate and mature stands containing large trees capable of providing cones and fungi, and Steller's jays prefer mature forest with open to moderate canopy cover and large, mature trees (Ibid). Thus, snags and down woody material serve different functional roles overtime for the goshawk, first providing cover for prey in the complex early seral stage of the forest, and ultimately decaying and playing a critical role in soil development of the future forest (Lindenmayer et al. 2008).

The management of goshawk habitat is typically thought of in three spatial scales (Reynolds et al. 1992, Reynolds et al. 2008). The first is the nesting habitat scale, or the PAC which corresponds to 200 acres. The second addresses the post-fledging area which corresponds to about 420 acres (USDA 2001), and the third addresses the whole foraging area or home range which corresponds to about 5,000 to 7,000 acres (Ibid).

Goshawks in the Sierra Nevada are year-round residents, and expand their breeding ranges in the winter (Keane 1999). As northern goshawks focus their breeding activities around roost and nest sites

within PACs and raising young to fledgling status close by, habitat modification effects are expected to be most pronounced in PACs and post-fledging areas.

Indicators

The following indicators were chosen to provide a relative measure of the direct and indirect effects to the goshawk and to determine how well project alternatives comply with Forest Plan Direction.

1. Acres of future moderate and high capability habitat planted or thinned.
2. Toxicological effects from herbicide use.

These criteria were chosen based on the best available scientific literature which focuses on various aspects of goshawk ecology and life history requirements. These criteria focus on those life history aspects, or habitat elements, considered most limiting to goshawk persistence across their range and where project effects are expected.

Alternatives 1, 3, and 5

Because there is little difference in the planting prescription and outcome in the short and long-term under these three alternatives, the effects are expected to be similar under these three alternatives and are analyzed together. The differences in herbicides proposed between Alternatives 1 and 5 versus Alternative 3 were separated below accordingly.

DIRECT AND INDIRECT EFFECTS

Indicator 1. *Reforestation (includes natural regeneration)*: Under Alternatives 1, 3, and 5, there are about 1,400 acres proposed for planting that fall within the estimated post fledgling areas of nine goshawk territories. Planting areas adjacent to and near goshawk territories as proposed under these alternatives would more quickly improve breeding habitat conditions for resident birds. Table 3.16-12 displays the affected territories and acres proposed for reforestation. Under these alternatives there are an additional 23,000 acres proposed for reforestation across the project area that have the potential to benefit goshawks at the landscape scale. Planting conifers as prescribed under these alternatives would increase the amount of habitat available to goshawks by 57 percent on STF lands in the long-term, maximizing the reestablishment of contiguous forested habitat across this landscape when compared to Alternatives 2 and 4. These alternatives would provide the greatest amount of habitat for goshawks in the long-term. Because habitat loss has been identified as a significant risk to goshawk persistence across their range, reestablishing forest habitat across the landscape is critical. At the landscape scale, reduced fragmentation and increased availability of suitable habitat is expected to benefit resident and dispersing goshawks.

Thinning: Under Alternatives 1, 3, and 5, there are about 85 acres proposed for planting that fall within the estimated post fledgling areas of five goshawk territories. Thinning existing plantation adjacent to and near occupied territories as proposed under these alternatives would also contribute to improving breeding habitat conditions for resident birds in the short and long-term. Table 3.16-12 also displays the affected territories and acres proposed for thinning. Under these alternatives there are an additional 7,150 acres of existing plantation proposed for thinning across the project area that have the potential to benefit goshawks at the landscape scale. While some of these plantations are considered suitable because they are CWHR size class 4 or 5 and have greater than 40 percent canopy cover, they lack structural diversity. Thinning these plantations would promote vertical and horizontal diversity which in turn improves habitat capability. The goal is to open up these stands, creating a habitat mosaic with individual trees, clumps of trees, and openings. The ICO design would provide structural diversity where it does not currently exist. For example, the prescription calls for releasing oaks and retaining a diversity of species and sizes of residual trees. After thinning, remaining trees are expected to grow faster and understory vegetation would become established, improving habitat conditions for goshawks and their prey in the short and long-term. In addition, by breaking up the

continuity of vegetation, the habitat would be more resilient when fire or other stochastic events occur.

Table 3.16-12 Proposed treatments within goshawk post-fledging areas and associated acres

Goshawk PAC ID	Reforestation[1]	Thin Existing Plantation	Total Acres Proposed for Treatment within Post-Fledging Area
Dimond O - D54T46	162	6	**168**
Bear Mtn - D54T01	222	14	**236**
Pilot Ridge - D54T08	106	0	**106**
Corral Crk - D54T10	246	0	**246**
Lower Cherry Crk - D54T13	1	41	**42**
Skunk Crk - D54T21	111	10	**121**
Niagra - D54T41	104	0	**104**
Soldier Crk - D54T43	116	0	**116**
SF Tuolumne River - D54T44	34	13	**47**

[1] Includes natural regeneration

Indicator 2. Under Alternatives 1 and 5, herbicide use is expected to have a limited potential for direct or indirect toxicological effects on goshawks, as described under the herbicide risk assessment section. Because no herbicides are proposed under Alternative 3, there would be no exposure to herbicides and no direct, indirect, or cumulative toxicological effects to goshawks under this alternative.

CUMULATIVE EFFECTS

The Forest queried its databases, including the Schedule of Proposed Actions (SOPA) to determine present and reasonably foreseeable future actions as well as present and reasonably foreseeable future actions on other public (non-Forest Service) and private lands (Appendix B, Rim Reforestation EIS). Some, but not all of these actions have or may contribute cumulatively to effects on goshawks.

Relevant risk factors potentially affecting goshawk abundance and distribution have been identified and primarily include loss of breeding habitat. Exposure to herbicides and potential toxicological effects associated with exposure were also identified as having the potential to affect goshawks. The following evaluation criteria were used as relative measures of cumulative effects from Alternatives 1, 3, and 5: habitat modification. In addition, toxicological effects were used as evaluation criteria for Alternatives 1 and 5.

Habitat Modification

Federal Lands: Present and foreseeable future activities on federal lands include: Funky Stewardship, Groovy Stewardship, Reynolds Creek Stewardship, Soldier Creek Timber Sale, Campy Timber Sale, Looney Timber Sale, Thommy Timber Sale, which are green thinning projects treating 6,546 acres of green forest across the analysis area. All snags and many declining trees will be retained unless they pose a safety hazard in these projects. The snag and declining tree retention will provide snags that could serve as potential roost or nest sites for goshawks in the short-term as well as recruits for future nest sites in the long-term. Other federal activities potentially impacting breeding habitat for goshawks is fuels reduction associated with the Rim Recovery project. Fuels reduction associated with this project will reduce the risk of further loss of remaining green forest within the project area.

Toxicological effects

Federal lands: There is one present federal action of herbicide use on 0.5 acres under the Rim Fire Rehabilitation project and two foreseeable federal actions of herbicide use: 8 acres under the Twomile Ecological Restoration Noxious Weed project and 23 acres associated with a special use permit for

the Reliable Power Project to control vegetation under powerlines. There are no other present or foreseeable future federal actions related to herbicide use.

Private lands: Herbicide use is proposed on 1,583 acres of private land within the project area in 2017. No other present or foreseeable future actions are proposed on private lands related to herbicide application.

Alternatives 1, 3, and 5 Contribution/Summary: Alternatives 1, 3, and 5 would contribute cumulatively to short and long-term effects to northern goshawks. Under these alternatives, reforestation on about 24,400 acres would increase the amount of moderate and high capability habitat available across the analysis area by 32 percent in the long-term. Under these alternatives about 7,240 acres of existing plantation would be thinned, promoting structural diversity and improving habitat capability in the short and long-term. These alternatives would result in similar benefits with respect to existing plantation thinning when compared to Alternative 4 because the thinning prescription is the same under all action alternatives. Alternatives 1 and 5 would contribute to the short-term limited potential of exposure to toxicity from herbicide use. Alternatives 1, 3, and 5 would result in the greatest increase in available habitat and connectivity at the landscape scale when compared to Alternatives 2 and 4. The cumulative contribution under this alternative is expected to benefit resident and dispersing goshawks and is not expected to affect the viability of this species.

Alternative 2

DIRECT AND INDIRECT EFFECTS

Indicator 1. Under No Action, death, injury or disturbance would not be an issue because no active management would occur.

The indirect effects of no action are primarily related to the influence no action may have on the amount of moderate and high capability habitat available, the restoration of habitat connectivity across the landscape, and how that may impact northern goshawks in the long-term. Under this alternative, about 9,800 acres of forested habitat is predicted to develop naturally with no active management across the landscape. This would increase habitat availability across STF lands by 23 percent, almost 2/3 less than that expected under Alternatives 1, 3, and 5. Because no active management would occur, it is unknown where naturally regenerating forest would occur and what benefits that would provide goshawks. It is likely that areas in close proximity to live trees (i.e. seed source) would experience forest expansion to a limited degree, depending on the competing vegetation in the localized area. It should be noted that natural conifer expansion is sporadic in nature, could be delayed for decades due to shrub suppression, would likely be dominated by fir, and would not result in significant gains in forested habitat (Vegetation, Chapter 3.13). Areas far from seed sources would likely persist as chaparral for decades if not well over a hundred years. Existing plantations would not be thinned under this alternative; therefore, increasing structural diversity and improving habitat quality would not be realized. The plantations could be at greater risk of loss when fire returns to this landscape because of the tightly spaced live trees and fuel loading from fire mortality than if treated as proposed under the action alternatives (Fuels, Chapter 3.05).

Indicator 2. Because no herbicides are proposed under Alternative 2, there would be no exposure to herbicides and no direct, indirect, or cumulative toxicological effects to goshawks under this alternative.

CUMULATIVE EFFECTS

The cumulative effects discussion under Alternatives 1, 3, and 5 outlines those present and foreseeable future activities scheduled on public and private lands.

Alternative 2 Contribution/Summary: Under Alternative 2, no direct cumulative effect is expected because no active management would occur, however, there may be indirect consequences under this

alternative primarily related to the influence no action may have on future forest development and how that may impact northern goshawks. At the landscape scale, the cumulative contribution under this alternative would increase the available suitable habitat by 13 percent (9,800 acres) compared to a 32 percent increase (acres) under Alternatives 1, 3, and 5. It is unknown where and long it would take natural regeneration to occur and what, if any, benefits that would provide to goshawks at the territory or landscape level. The cumulative contribution under this alternative may negatively affect individual or resident birds, but is not expected to affect the viability of this species.

Alternative 4

DIRECT AND INDIRECT EFFECTS

Indicator 1. *Reforestation:* Under Alternative 4, there are about 208 acres proposed for planting that fall within the estimated post fledgling areas of nine goshawk territories. This is 1,200 acres less than Alternatives 1, 3, and 5. Table 3.16-13 displays these territories and acres proposed for reforestation. Under this alternative, there are up to 2,742 additional acres proposed for reforestation within the project area. The planting prescription under this alternative is termed founder stands. This prescription calls for small variable shaped planting areas ranging from two to ten acres in size within a larger unplanted area. The unplanted area would likely be comprised of chaparral with scattered oaks. The planted area is only 20 percent of a given unit. Herbicides would be used to control shrubs and competing vegetation within planted areas and incorporating a 25 to 50 foot buffer around planted areas. These trees would be planted with a much tighter spacing, groups of 5 trees spaced 6 feet from each other. With the tighter spacing of planted trees, it may be necessary to thin the plantations around year 7 to allow growing space for the trees to mature. Prescribed fire or hand tools would be used to thin the new plantations. Prescribed fire would be applied to 50 percent of planted areas within ten years and the other 50 percent within 20 years. Reforesting in this manner would result in several small fragmented patches of forested habitat no bigger than ten acres separated by large tracts of chaparral. Small patches of forested habitat covering 20 percent of a given area would not provide the moderate and high capability habitat required by breeding goshawks, which include large tract of contiguous forest. Similar to the No Action Alternative, about 9,800 acres of forested habitat is predicted to develop naturally with no active management across the landscape. Because no active management would occur on these acres, it is unknown where naturally regenerating forest would occur and what benefits it would provide for goshawks. It is likely that areas in close proximity to live trees (i.e. seed source) would experience forest expansion to a limited degree, depending on the competing vegetation in the localized area. It should be noted that natural conifer expansion is sporadic in nature, could be delayed for decades due to shrub suppression, would likely be dominated by fir, and would not result in significant gains in forested habitat (Vegetation, Chapter 3.13). Areas far from seed sources would likely persist as chaparral for decades if not well over a hundred years. While this alternative, almost entirely natural regeneration, would increase the amount of forested habitat across STF lands by up to 30 percent, it is unknown how fragmented or contiguous the distribution would be across the landscape and if it would provide benefits to goshawks at the territory or landscape scale.

Thinning: There are about 7,235 acres of existing plantation proposed for thinning that have the potential to benefit goshawks at the at the PAC, post-fledging, and landscape scale. Effects expected from plantation thinning are the same as those discussed under Alternatives 1, 3, and 5.

Table 3.16-13 Proposed treatments within goshawk post-fledging areas and associated acres

Goshawk PAC ID	Reforestation[1]	Thin Existing Plantation	Total Acres Proposed for Treatment in Post-Fledging Area
Dimond O - D54T46	26	6	**31**
Bear Mtn - D54T01	46	14	**59**
Pilot Ridge - D54T08	15	0	**15**
Corral Crk - D54T10	47	0	**47**
Lower Cherry Crk - D54T13	8	41	**49**
Skunk Crk - D54T21	22	10	**32**
Niagra - D54T41	19	0	**19**
Soldier Crk - D54T43	22	0	**22**
SF Tuolumne River - D54T44	3	13	**16**

[1] Includes natural regeneration

Indicator 2. Herbicide use is expected to have a limited potential for direct or indirect toxicological effects on goshawks, as described under the herbicide risk assessment section.

CUMULATIVE EFFECTS

The cumulative effects discussion under Alternatives 1, 3, and 5 outlines those present and foreseeable future activities scheduled on public and private lands.

***Alternative 4 Contribution/Summary*:** Alternative 4 would contribute cumulatively to short and long-term effects to northern goshawks. Under this alternative, reforestation on up to 2,950 acres in discreet patches no larger than ten acres is not expected to result in benefits to goshawk. Reforestation and natural forest recovery under this alternative is expected to increase available habitat by up to 17 percent across the analysis area. However, this natural forest recovery is expected to be sporadic, delayed, and a limited contribution to moderate and high capability habitat in the long-term. The founder stands prescription is not expected to provide moderate and high capability habitat because it would be located in small fragmented patches separated by large tracts of chaparral. Under this alternative about 7,235 acres of existing plantation would be thinned, promoting structural diversity and improving habitat capability in the short and long-term. This alternative would result in similar benefits with respect to existing plantation thinning when compared to Alternatives 1, 3, and 5 because the thinning prescription is the same under all action alternatives. Alternative 4 would contribute to the short-term limited potential of exposure to toxicity from herbicide use. The cumulative contribution under this alternative is expected to provide limited benefits to resident and dispersing goshawks and is not expected to affect the viability of this species.

Northern Goshawk: Summary of Effects

Indicator 1. Table 3.16-14 shows the number of acres proposed for reforestation (planting) and the number of acres of existing plantation proposed for thinning at the post-fledging and landscape scales. Alternatives 1, 3, and 5 would provide the greatest amount of moderate and high capability habitat for goshawks in the long-term when compared to Alternative 4. All action alternatives would result in the same amount of future moderate and high capability habitat within the treated existing plantations; however, Alternative 4 does not complement the existing plantation treatments by accelerating forest reestablishment in adjacent areas or across the landscape as proposed under Alternatives 1, 3, and 5.

Table 3.16-14 Northern Goshawk Summary of Effects

Indicator	Metric	Alternative				
		1	2	3	4	5
1. Future moderate to high capability habitat (planted or thinned)	Acres reforested in post-fledging area[1]	1,400	0	1,400	208	1,400
	Acres reforested[1] (landscape)	23000	0	23,000	2,742	23,000
	Total acres	**24,400**	**0**	**24,400**	**2,950**	**24,400**
	Acres of existing plantation thinned in post fledgling area	85	0	85	85	85
	Acres of existing plantation thinned (landscape)	7,235		7,235	7,235	7,235
	Total acres	**7,320**	**0**	**7,320**	**7,320**	**7,320**

[1] Includes natural regeneration

Indicator 2. Herbicide use under Alternatives 1, 4, and 5 are expected to have limited potential for direct or indirect toxicological effects on goshawks. Because Alternative 4 has fewer acres of herbicide application proposed, the potential for effects would be less than under Alternatives 1 and 5. However, it is important to note that the toxicity exposure scenarios analyzed in the risk assessment show that all HQs are several orders of magnitude less than the NOAEL threshold of concern or No Observable Adverse Effect Level; therefore, goshawks are provided an adequate margin of safety in the event that they are exposed to contaminated prey or water.

Determination of Effects

ALTERNATIVES 1 AND 5

It is my determination that Alternatives 1 and 5 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the Northern goshawk. My determination is based on the following rationale:

- These alternatives include actions to reestablish contiguous forested habitat, accelerating the time in which these areas would be suitable for nesting, roosting, and foraging.
- These alternatives include actions to thin existing plantations, accelerating the time in which these areas would be suitable for nesting, roosting, and foraging.
- Habitat connectivity would be restored under these alternatives.
- Snag retention in close proximity to green forest would result in maintaining roosting and nesting structures as well as habitat for prey throughout the treated areas.
- These alternatives require the use of LOPs to reduce disturbance potential to breeding goshawks.
- These alternatives provide for surveys to establish or confirm the location of activity centers and boundaries.
- Toxicity exposure levels from herbicide use under these alternatives are all several orders of magnitude below the Forest Service established threshold of concern.

ALTERNATIVE 2

It is my determination that Alternative 2 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the Northern goshawk. My determination is based on the following rationale:

- This alternative would result in the smallest increase in moderate to high capability habitat available to goshawk in the long-term.
- The structural diversity of existing plantations would not be promoted and thus habitat quality would not be improved in the short or long-term.
- Existing plantations may be at greater risk of loss when fire returns to this landscape.
- There would be no potential for exposure to herbicides.

ALTERNATIVE 3

It is my determination that Alternative 3 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the Northern goshawk. My determination is based on the following rationale:

- This alternative includes actions to reestablish contiguous forested habitat, accelerating the time in which these areas would be suitable for nesting, roosting, and foraging.
- This alternative includes actions to thin existing plantations, accelerating the time in which these areas would be suitable for nesting, roosting, and foraging.
- Habitat connectivity would be restored under this alternative.
- Snag retention in close proximity to green forest would result in maintaining roosting and nesting structures as well as habitat for prey throughout the treated areas.
- This alternative requires the use of LOPs to reduce disturbance potential to breeding goshawks.
- This alternative provides for surveys to establish or confirm the location of activity centers and boundaries.
- There would be no potential for exposure to herbicides.

ALTERNATIVE 4

It is my determination that Alternative 4 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the Northern goshawk. My determination is based on the following rationale:

- This alternative includes actions to establish small fragmented patches of forest that would not provide suitable nesting or roosting habitat.
- This alternative includes actions to thin existing plantations, accelerating the time in which these areas would be suitable for nesting, roosting, and foraging.
- Snag retention in close proximity to green forest would result in maintaining roosting and nesting structures as well as habitat for prey throughout the treated areas.
- This alternative requires the use of LOPs to reduce disturbance potential to breeding goshawks.
- This alternative provides for surveys to establish or confirm the location of activity centers and boundaries.
- Toxicity exposure levels from herbicide use under this alternative are all several orders of magnitude below the Forest Service established threshold of concern.

Northern Goshawk: Compliance with Forest Plan and other Direction

Applicable Forest Plan Direction

USDA 2010 p. 43: Assess the potential impact of projects on the connectivity of habitat for old forest associated species.

USDA 2010 p. 44: General guidelines for large-snag retention are as follows: 1) in westside mixed conifer and ponderosa pine types - four of the largest snags per acre.

USDA 2010 p. 186: Maintain a limited operating period (LOP), prohibiting vegetation treatments within approximately ¼ mile of the nest site during the breeding season (February 15 through September 15) unless surveys confirm that northern goshawks are not nesting. If the nest stand within a protected activity center (PAC) is unknown, either apply the LOP to a ¼- mile area surrounding the PAC, or survey to determine the nest stand location.

USDA 2010 p. 185: Manage PACs for higher than average levels of snags and down woody material.

USDA 2010 p. 189: Manage HRCAs for higher than average levels of snags and down woody material.

Forest Plan Compliance

THE ACTION ALTERNATIVES 1, 3, 4 AND 5 DEMONSTRATE FOREST PLAN COMPLIANCE THROUGH THE FOLLOWING

Alternatives 1, 3, and 5 address and propose actions to increase habitat connectivity.

Alternative 4 does not consider or address habitat connectivity.

Alternative 1, 3, 4, and 5 manage for the minimum levels of snags within General Forest, per guidelines in forest plan direction.

Alternatives 1, 3, 4, and 5 manage for higher than average levels of snags and down woody material within PACs, Old Forest Emphasis, and Home Range Core Areas, the land allocations managed for old forest objectives.

Alternatives 1, 3, 4, and 5 apply LOPs as required.

Pacific Marten: Affected Environment

Species and Habitat Account

The marten (*Martes caurina*) is a Region 5 Forest Service Sensitive species and is also a Sierra Nevada Management Indicator Species (MIS), as described in the Rim Fire Reforestation MIS report available in the project record. Marten occur throughout much of their historic range from Trinity and Siskyou counties east to Mount Shasta, south through the Cascades and Sierra Nevada Mountain ranges to Tulare County. They are considered rare when compared to other forest carnivore species (USDA 2001). Their core elevation range is 5,500 – 10,000 feet. Marten have been documented on the Stanislaus National Forest as low as 3,200 feet elevation.

Population estimates and trends are not available for marten in California. Although classified as a furbearer, there has been no open trapping season for this species since 1954 (USDA 2001). Declines in marten population size in the early twentieth century have been attributed to habitat modifications, trapping, and predator control. Based on surveys conducted from 1989-2002, the marten appears to occupy much of its historic range in California (Zielinski et al. 1995, Slauson et al. 2007).

Carnivore camera stations have been employed within suitable habitat in and near the project area in 2005-2015. No marten detections were made as a result of these survey efforts (USDA 2015a).

The project is within the current distribution of marten across the Sierra Nevada Bioregion. The nearest documented occurrence of marten was in 2006 less than two miles north of the project area near Reynolds Creek and south of the project area in Yosemite National Park. Their presence within the analysis area is unknown; however, presence is assumed where suitable habitat exists. Because there are no documented den sites, LOPs for this species are not required for this project.

Marten are considered one of the most habitat-specific mammals in North America. Habitat quality is likened to the structural diversity consistent with late seral, mesic coniferous forests, interspersed with riparian areas and meadows. Preferred forest vegetation types include red fir, red fir/white fir mix, lodgepole pine, and Sierra mixed conifer (Freel 1991). Marten home ranges are very large relative to their body size. Mean home ranges in the central Sierra Nevada are 960 acres for males and 801 acres for females (USDA 2001). The analysis area still contains relatively high quality habitat for marten in areas that burned at low or low-moderate intensity such as Twomile, Bourland, and Reynolds Creek, Pilot Ridge and the Crocker Meadow area. Moderate to high capability habitat is defined as that in which a CWHR suitability rating is ≥ 0.55. Two of three categories (reproduction, cover, food) must have a medium rating to qualify as moderate or high capability habitat. Suitable habitat consists of CWHR habitat types Jeffrey pine, lodgepole pine, montane hardwood conifer, ponderosa pine, red fir, sierra mixed conifer, and white fir and size classes 4P, M, D, 5M, D. The analysis area contains about 17,692 acres of moderate and high capability habitat on NFS lands only. There are about 45,300 acres

of moderate and high capability habitat within the cumulative effects analysis area, including all ownerships.

A road density of <1 mile of road per square mile has been recommended for high quality habitat for marten and a road density of 1 to 2 miles per square mile is recommended for medium capability habitat (USDA 1991). The road density including all routes open to motor vehicles in the analysis area is 3.0 miles per square mile on NFS lands and is more than twice the acceptable density found in high quality habitat and more than 1 mile per square mile above that found in moderate capability habitat.

Marten natal dens are typically found in cavities in large trees, snags, stumps, logs, shrubs, burrows, caves, rocks, or crevices in rocky areas (USDA 1991 and Zielinski et al. 1997). Dens are lined with vegetation and are found in structurally complex, late succession forests (Buskirk and Powell 1994). Breeding occurs from late June to early August, followed by embryonic diapause, and birth in March-April (Ibid).

Freel (1991), Slauson (2003), and Spencer et al. (1983) characterized suitable habitat for denning/resting marten as follows:

- Canopy cover ≥ 70%.
- Largest live conifers are ≥ 24"dbh and occur at a density of at least 9/acre.
- Live tree basal area ranges from 163-326 sq ft/acre.
- Snags average 25 square feet basal area per acre and average 30 inches dbh.
- Coarse woody debris is present at 5-10 tons/acre in decay classes 1-2.

Marten diet varies geographically and seasonally with local prey availability. In the Central Sierra, marten diets are comprised primarily of voles, while in the southern Sierra it is squirrels and voles, insects, hypogenous fungi and secondarily (less than 20% of diet) reptiles and birds (Zielinski et al. 1983, Zielinski and Duncan 2004b). Zielinski and others (1983) noted Douglas squirrels, snowshoe hare, northern flying squirrels and deer mice were the prey species used almost exclusively during the winter, while ground squirrels formed the largest component of the diet from late spring through fall.

Coarse woody debris is an important component of marten habitat, especially in winter, when it provides structure that intercepts snowfall and creates subnivean (below snow) tunnels, interstitial spaces, and access holes. Zielinski and others (1983) suggested that marten activity varied to take advantage of subnivean dens utilized by their prey. Sherburne and Bissonette (1994) found that when coarse woody debris covered a greater percent of the ground, marten use also increased. Older growth forests appeared to provide accumulated coarse woody debris necessary to enable marten to forage effectively during the winter.

Freel (1991) and Spencer et al. (1983) characterized suitable habitat for travel/foraging marten as follows:

- Canopy cover ≥ 40%.
- Largest live conifers are ≥ 24"dbh and occur at a density of at least 6/acre.
- Largest snags average 2.5/acre and are ≥ 24"dbh (8 sq ft/acre).
- Coarse woody debris is present at 5-10 tons/acre in decay classes 1-3.

Reports of long-distance movements, likely representing dispersal, are largely anecdotal. Movement patterns in marten, dispersal and migration, have not been intensively studied for this species because of the difficulty and high cost of studying long-distance movements in small bodied mammals (Buskirk and Powell 1994, Ruggiero et al. 1994). Martens exhibit seasonal variation in habitat selection within stable home ranges, with little evidence to suggest shifts in home range boundaries.

Risk Factors

Hargis et al. (1999) and USDA (2001) summarize several risk factors potentially influencing marten abundance and distribution:

1. *Habitat fragmentation* – Fragmentation can limit occupancy and dispersal of marten across the landscape. Marten were negatively associated with low levels of habitat fragmentation. When the average nearest neighbor distance between non-forested patches was < 100 m, it created more edge and less interior forested habitat preferred by marten.
2. *Meadow habitat degradation* – Grazing can reduce the amount of shrub and herbaceous cover available and can increase soil compaction for prey species such as voles.
3. *Fire suppression* – Fire suppression has contributed to degraded conditions in meadows and riparian habitats by allowing encroachment of trees which reduces the availability of understory vegetation required by prey.
4. *Lack of, or removal of coarse woody debris* - Removal of coarse woody debris (piles of several smaller logs, or single large logs) can also reduce access and abundance of prey during the important winter months, and may also reduce resting site availability for marten.

Management Direction

Current management direction is defined by project-level standards and guidelines from the Forest Plan (USDA 2010) and is based on the desired future condition of land allocations (Robinson 1996). The marten is a Region 5 Forest Service Sensitive species that is associated with old forest ecosystems (USDA 2004). The following land allocations pertain to marten and old forest ecosystems: Protected Activity Centers (PACs), Home Range Core Area (HRCA), and Old Forest Emphasis Area (OFEA).

The desired condition for Protected Activity Centers (PAC) is to have 1) at least two tree canopy layers; 2) dominant and co-dominant trees with average diameters of at least 24 inches dbh; 3) at least 60 to70 percent canopy cover; 4) some very large snags (greater than 45 inches dbh); and 5) snag and down woody material levels that are higher than average.

The desired condition for Spotted Owl Home Range Core Area (HRCA) is to encompass the best available habitat in the closest proximity to the owl activity center (USDA 2004 ROD pp. 39-40). HRCAs consist of large habitat blocks that have: 1) at least two tree canopy layers; 2) at least 24 inches dbh in dominant and co-dominant trees; 3) a number of very large (greater than 45 inches dbh) old trees; 4) at least 50 to 70 percent canopy cover; and 5) higher than average levels of snags and down woody material.

The desired condition for Old Forest Emphasis Area (OFEA) is to provide habitat conditions for mature forest associates (northern goshawk, spotted owl, Pacific marten, and fisher). Specifically, forest structure and function across old forest emphasis areas generally resemble pre-settlement conditions.

High levels of horizontal and vertical diversity exist at the landscape-scale (roughly 10,000 acres). Stands are composed of roughly even-aged vegetation groups, varying in size, species composition, and structure. Individual vegetation groups range from less than 0.5 to more than 5 acres in size. Tree sizes range from seedlings to very large diameter trees. Species composition varies by elevation, site productivity, and related environmental factors. Multi-tiered canopies, particularly in older forests, provide vertical heterogeneity. Dead trees, both standing and fallen, meet habitat needs of old-forest-associated species. Forest structure and function generally resemble pre-settlement conditions (Figure 1).

Pacific Marten: Environment Consequences

The project alternatives could result in direct and indirect effects to the marten through the following activities:

- Mechanical site prep for planting.
- Herbicide application for site prep and release of conifers.
- Planting conifers.

These activities may have direct and indirect effects on marten through the following:

- Project related death, injury or disturbance.
- Project related modifications to habitat quantity or quality.

Death, injury, and disturbance

Death or injury from project related activities would be unlikely to occur given the mobility of this species. However, there is the potential for death or injury if a den or rest tree were felled while being used by martens.

Project activities, especially loud noise, could result in disturbance that may impair essential behavior patterns of the marten related to denning, resting, or foraging. Loud noise from equipment such as chain saws, tractors, or feller bunchers is expected to occur in reforestation and thinning units, project roads, and at landings. The location of marten within the analysis area is uncertain following the Rim Fire, a large-scale disturbance event. Temporary avoidance of the project site or displacement of individuals is expected during project implementation. Any displacement or avoidance would be of short duration and would subside shortly after project implementation activities. LOPs in place for spotted owls and goshawks would afford protection to individual marten in these areas during parturition, kit rearing, and subsequent breeding (March-August). The potential risk to individual marten is considered low because of the lack of documented marten occurrence within or near the analysis area.

Habitat Modification

Reforesting areas that burned at high severity would accelerate development of forest habitat, increasing the amount of habitat available and restoring connectivity across the landscape. Active or managed reforestation is predicted to provide more complex habitat conditions in the long-term. For example, active reforestation would result in more large trees (e.g., ≥ 24" dbh) and higher levels of snag recruitment when compared to the No Action Alternative. Thinning existing plantations is also expected to accelerate growth rates and increase structural stand diversity, improving foraging and breeding habitat conditions sooner than without thinning. Thinning these areas would also increase resilience when managed or wildfire returns to this landscape. Reducing fragmentation across the landscape and increasing the amount of interior forest is likely to increase habitat effectiveness and use by marten (Hargis et al. 1999).

Retention of snags and large downed woody debris is proposed under all action alternatives. Retention of snags and downed logs within reforestation and thinning units and in close proximity to currently suitable habitat (green forest) would provide denning and resting sites, as well as habitat for prey species (Freel 1991). The number of snags and downed logs available across a marten's home range affects the quality of that habitat for foraging and breeding. For example, they select sites with at least 25 square feet basal area per acre of large snags (Slauson 2003, Spencer et al. 1983). While Spencer does not report an average dbh of snags, Slauson (2003) reports snags average 30 inches dbh in areas where marten were detected. In moderate and high capability traveling and foraging habitat they use areas with fewer snags, eight to twelve square feet basal area per acre that are 24 inches dbh or greater (Freel 1991).

Long-term, large snags and large downed logs are considered biological legacies in a post fire environment and play important roles in the structure of future forest (Lindenmayer et al. 2008). Large snags and downed logs may take hundreds of years to develop, emphasizing the need to retain these elements across the landscape. Because large snags and large downed logs are important habitat elements found in high capability marten habitat, it is important to retain these structural elements during project implementation to provide structural diversity within thinned or newly planted areas.

Indicators

The following indicators were chosen to provide a relative measure of the direct and indirect effects to the marten and to determine how well project alternatives comply with Forest Plan Direction.

1. Acres of future moderate and high capability habitat planted and thinned.
2. Toxicological effects from herbicide use.

These criteria were chosen based on the best available scientific literature which focuses on various aspects of marten ecology and life history requirements. These criteria focus on those life history aspects, or habitat elements, considered most limiting to marten persistence across their range and where project effects are expected.

Alternatives 1, 3, and 5

Because there is no difference in areas proposed for reforestation or thinning, under these three alternatives, the effects are expected to be similar and are analyzed together. The differences in herbicides proposed between Alternatives 1 and 5 versus Alternative 3 were separated below accordingly.

DIRECT AND INDIRECT EFFECTS

Indicator 1. *Reforestation (includes natural regeneration):* Under these alternatives, there are about 3,400 acres proposed for reforestation within the elevation range typically used by marten. Planting conifers as prescribed under these alternatives would result in the restoration of moderate and high capability forested habitat across the landscape. This would increase the amount of habitat available to marten by 19 percent on STF lands in the long-term. While habitat connectivity is still largely intact at the landscape scale within the elevation range considered for marten, the reforestation as proposed would restore habitat connectivity to adjacent private lands that are also being reforested.

Thinning: There are about 4,900 acres of existing plantation proposed for thinning within the elevation range used by marten. While some of these plantations are considered suitable because they are CWHR size class 4 or 5 and have greater than 40 percent canopy cover, they lack structural diversity. Thinning these plantations would promote vertical and horizontal diversity which in turn improves habitat capability. The goal is to open up these stands, creating a habitat mosaic with individual trees, clumps of trees, and openings. The ICO design would provide structural diversity where it does not currently exist. For example, the prescription calls for releasing oaks and retaining a diversity of species and sizes of residual trees. After thinning, remaining trees are expected to grow faster and understory vegetation would become established, improving habitat conditions for marten and their prey in the short and long-term. In addition, by breaking up the continuity of vegetation, the habitat would be more resilient when fire or other stochastic events occur.

These alternatives address and maximize habitat suitability and connectivity in the short and long-term for marten on this landscape. Because marten have not been documented in the project area, it is unknown if marten would realize the benefits discussed herein.

Indicator 2. Under Alternatives 1 and 5, herbicide use is expected to have an extremely limited potential for direct or indirect toxicological effects on marten, as described under the herbicide risk assessment section. Because no herbicides are proposed under Alternative 3, there would be no

exposure to herbicides and no direct, indirect, or cumulative toxicological effects to marten under this alternative.

CUMULATIVE EFFECTS

The Forest queried its databases, including the Schedule of Proposed Actions (SOPA) to determine present and reasonably foreseeable future actions as well as present and reasonably foreseeable future actions on other public (non-Forest Service) and private lands (Appendix B, Rim Reforestation EIS). Some, but not all of these actions have or may contribute cumulatively to effects on marten.

Relevant risk factors potentially affecting marten abundance and distribution have been identified and primarily include habitat fragmentation and removal of coarse woody debris. Exposure to herbicides and potential toxicological effects associated with exposure were also identified as having the potential to affect marten. The following evaluation criteria were used as relative measures of cumulative effects from Alternatives 1, 3, and 5: habitat modification. In addition, toxicological effects were used as evaluation criteria for Alternatives 1 and 5.

Habitat modification

Federal Lands: Present and foreseeable future activities on federal lands include: Funky Stewardship, Groovy Stewardship, Reynolds Creek Stewardship, Soldier Creek Timber Sale, Campy Timber Sale, Looney Timber Sale, Thommy Timber Sale, which are green thinning projects treating 6,546 acres of green forest across the analysis area. All snags and many declining trees will be retained unless they pose a safety hazard in these projects. Downed woody debris will be retained at rates up to 20 tons per acre. The snag, declining tree, and downed log retention in these projects will provide snags and downed logs that could serve as potential denning or resting sites for marten in the short-term as well as recruits for future den and rest sites in the long-term. Fuels reduction associated with the Rim Recovery project will reduce the risk of further loss of remaining green forest within the project area. Other federal activities potentially impacting habitat for marten is meadow restoration.

Meadow restoration projects (Reynolds Creek, Rim Fire Rehabilitation, Twomile Meadow Restoration) are expected to improve foraging habitat across about 290 acres for marten. Treatments would result in improved functioning of meadow habitat, thus improve conditions for prey species that utilize these areas.

Toxicological effects

Federal lands: There is one present federal action of herbicide use on 0.5 acres under the Rim Fire Rehabilitation project and two foreseeable federal actions of herbicide use: 8 acres under the Twomile Ecological Restoration Noxious Weed project and 23 acres associated with a special use permit for the Reliable Power Project to control vegetation under powerlines. There are no other present or foreseeable future federal actions related to herbicide use.

Private lands: Herbicide use is proposed on 1,583 acres of private land within the project area in 2017. No other present or foreseeable future actions are proposed on private lands related to herbicide application.

Alternatives 1, 3, and 5 contribution/summary: Alternatives 1, 3, and 5 would contribute cumulatively to short and long-term effects to marten. Under these alternatives, reforestation on about 3,400 acres would provide the most suitable foraging, denning, and resting habitat when compared to Alternative 4. These alternatives would result in a eight percent increase in moderate and high capability habitat available across the analysis area in the long-term from reforestation. Under these alternatives about 4,900 acres of existing plantation would be thinned, promoting structural diversity and improving habitat capability in the short and long-term. These alternatives would result in similar benefits with respect to existing plantation thinning when compared to Alternative 4 because the thinning prescription is the same under all action alternatives. Alternatives 1 and 5 would contribute to the

short-term limited potential of exposure to toxicity from herbicide use. Because there are no documented occurrences of marten in the project area, it is unknown to what degree the cumulative contribution under this alternative may affect individuals. The cumulative effects considered herein are not expected to affect the viability of this species.

Alternative 2

DIRECT AND INDIRECT EFFECTS

Indicator 1. Under No Action, death, injury or disturbance would not be an issue because no active management would occur.

The indirect effects of no action are primarily related to the influence no action may have on the amount of suitable forested habitat available to marten in the long-term. Under this alternative, only about 940 acres of forested habitat is predicted to develop naturally with no active management within the elevation range marten are expected to occur. Because no active management would occur, it is unknown where naturally regenerating forest would occur and what benefits that would provide marten. It is likely that areas in close proximity to live trees (i.e. seed source) would experience forest expansion to a limited degree, depending on the competing vegetation in the localized area. It should be noted that natural conifer expansion is sporadic in nature, could be delayed for decades due to shrub suppression, would likely be dominated by fir, and would not result in significant gains in forested habitat (Vegetation, Chapter 3.13). Areas far from seed sources would likely persist as chaparral for decades if not more than a hundred years. Existing plantations would not be thinned under this alternative; therefore, increasing structural diversity and improving habitat quality would not be realized. The plantations could be at greater risk of loss when fire returns to this landscape because of the tightly spaced live trees and fuel loading from fire mortality than if treated as proposed under the action alternatives. Habitat connectivity is still relatively intact where marten are expected to occur. This alternative would result in a very small increase in long-term habitat available to marten on STF lands.

Indicator 2. Because no herbicides are proposed under Alternative 2, there would be no exposure to herbicides and no direct, indirect, or cumulative toxicological effects to marten under this alternative.

CUMULATIVE EFFECTS

The cumulative effects discussion under Alternatives 1, 3, and 5 outlines those present and foreseeable future activities scheduled on public and private lands.

Alternative 2 Contribution/Summary: Under Alternative 2, no direct cumulative effect is expected because no active management would occur, however, there may be indirect consequences under this alternative primarily related to the influence no action may have on future forest development and how that may impact marten. At the landscape scale, the cumulative contribution under this alternative would only increase the available suitable habitat by two percent (940 acres) compared to an eight percent increase (3,400 acres) under Alternatives 1, 3, and 5. Because there are no documented occurrences of marten in the project area, it is unknown to what degree the cumulative contribution under this alternative may affect individuals. The cumulative effects considered herein are not expected to affect the viability of this species.

Alternative 4

DIRECT AND INDIRECT EFFECTS

Indicator 1. Effects expected resemble those discussed under the No Action alternative. Under this alternative, there are up to 30 acres of unsuitable habitat proposed for reforestation within the elevation range typically used by marten. Natural, unmanaged forest development is estimated to result in an increase of habitat available to marten by five percent on STF lands in the long-term, as discussed in the No Action alternative.

There are about 4,900 acres of existing plantation proposed for thinning within the elevation range used by marten. Effects expected from plantation thinning are the same as those discussed under Alternatives 1, 3, and 5.

This alternative does not address or maximize habitat suitability and connectivity in the short or long-term for marten on this landscape. Because marten have not been documented in the project area, it is unknown if marten would be affected by implementation of this alternative or to what degree.

Indicator 2. Herbicide use is expected to have an extremely limited potential for direct or indirect toxicological effects on marten, as described under the herbicide risk assessment section.

CUMULATIVE EFFECTS

The cumulative effects discussion under Alternatives 1, 3, and 5 outlines those present and foreseeable future activities scheduled on public and private lands.

Alternative 4 Contribution/Summary: Alternative 4 would contribute cumulatively to short and long-term effects to marten. Under this alternative, reforestation on up to 30 acres is not expected to result in measureable benefits to marten. Natural forest recovery under this alternative is expected to increase available habitat by two percent across the analysis area, the same as under the No Action alternative. This is 2,460 acres less forested habitat available to marten when compared to Alternatives 1, 3, and 5. Under this alternative about 4,900 acres of existing plantation would be thinned, promoting structural diversity and improving habitat capability in the short and long-term. This alternative would result in similar benefits with respect to existing plantation thinning when compared to Alternatives 1, 3, and 5 because the thinning prescription is the same under all action alternatives. Alternative 4 would contribute to the short-term extremely limited potential of exposure to toxicity from herbicide use. Because there are no documented occurrences of marten in the project area, it is unknown to what degree the cumulative contribution under this alternative may affect individuals. The cumulative effects considered herein are not expected to affect the viability of this species.

Pacific Marten: Summary of Effects

Indicator 1. Table 3.16-15 shows the number of acres proposed for reforestation (planting) and the number of acres of existing plantation proposed for thinning within the elevation range typically used by marten. Alternatives 1, 3, and 5 would provide more moderate to high capability habitat for marten when compared to Alternative 4. All action alternatives would result in the same amount of future moderate and high capability habitat within the treated existing plantations.

Table 3.16-15 Pacific Marten Summary of Effects

Indicator	Metric	Alternative				
		1	2	3	4	5
1. Future moderate to high capability habitat (planted or thinned)	Acres reforested[1]	3,400	0	3,400	30	3,400
	Acres of existing plantation thinned	4,900	0	4,900	4,900	4,900
	Total acres	**8,300**	**0**	**8,300**	**4,930**	**8,300**

[1] Includes natural regeneration

Indicator 2. Herbicide use under Alternatives 1, 4, and 5 are expected to have an extremely limited potential for direct or indirect toxicological effects on marten because of the low Hazard Quotients related to exposure and the fact that no marten have been documented in the project area. Because Alternative 4 has fewer acres of herbicide application proposed, the potential for effects would be less than under Alternatives 1 and 5. It is important to note that the toxicity exposure scenarios analyzed in the risk assessment show that all HQs are well below the threshold of concern, and most are several orders of magnitude less than the threshold of concern or No Observable Adverse Effect Level.

Marten are provided an adequate margin of safety in the event that they are exposed to contaminated prey, fruit, or water.

Determination of Effects

ALTERNATIVES 1 AND 5

It is my determination that Alternatives 1 and 5 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the Pacific marten. My determination is based on the following rationale:

- These alternatives include actions to reestablish forested habitat, accelerating the time in which these areas would be suitable for resting, denning, and foraging.
- These alternatives include actions to thin existing plantations, accelerating the time in which these areas would be suitable for resting, denning, and foraging.
- Habitat connectivity would be restored under these alternatives.
- Snag retention in close proximity to green forest would result in maintaining denning and resting structures as well as habitat for prey throughout the treated areas.
- LOPs in place for wildlife associated with similar habitat under these alternatives would reduce disturbance potential to marten.
- Toxicity exposure levels from herbicide use under these alternatives are all well below the Forest Service established threshold of concern.

ALTERNATIVE 2

It is my determination that Alternative 2 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the Pacific marten. My determination is based on the following rationale:

- This alternative would result in the smallest increase in moderate to high capability habitat available to marten in the long-term.
- The structural diversity of existing plantations would not be promoted and thus habitat quality would not be improved in the short-term.
- Existing plantations may be at greater risk of loss when fire returns to this landscape.
- There would be no potential for exposure to herbicides.

ALTERNATIVE 3

It is my determination that Alternative 3 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the Pacific marten. My determination is based on the following rationale:

- This alternative includes actions to reestablish forested habitat, accelerating the time in which these areas would be suitable for resting, denning, and foraging.
- This alternative includes actions to thin existing plantations, accelerating the time in which these areas would be suitable for resting, denning, and foraging.
- Habitat connectivity would be restored under this alternative.
- Snag retention in close proximity to green forest would result in maintaining denning and resting structures as well as habitat for prey throughout the treated areas.
- LOPs in place for wildlife associated with similar habitat under these alternatives would reduce disturbance potential to marten.
- There would be no potential for exposure to herbicides.

ALTERNATIVE 4

It is my determination that Alternative 4 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the Pacific marten. My determination is based on the following rationale:

- This alternative includes actions to thin existing plantations, accelerating the time in which these areas would be suitable for resting, denning, and foraging.
- Snag retention in close proximity to green forest would result in maintaining denning and resting structures as well as habitat for prey throughout the treated areas.
- LOPs in place for wildlife associated with similar habitat under these alternatives would reduce disturbance potential to marten.
- Toxicity exposure levels from herbicide use under this alternative are all well below the Forest Service established threshold of concern.

Pacific Marten: Compliance with Forest Plan Direction

Applicable Forest Plan Direction

USDA 2010 p. 43: Assess the potential impact of projects on the connectivity of habitat for old forest associated species.

USDA 2010 p. 44: General guidelines for large snag retention are as follows: 1) in westside mixed conifer and ponderosa pine types – four of the largest snags per acre.

Forest Plan Compliance

THE ACTION ALTERNATIVES 1, 3, 4 AND 5 DEMONSTRATE FOREST PLAN COMPLIANCE THROUGH THE FOLLOWING

Alternatives 1, 3, and 5 address and propose actions to increase habitat connectivity.

Alternative 4 does not consider or address habitat connectivity.

Alternative 1, 3, 4, and 5 manage for the minimum levels of snags within General Forest, per guidelines in forest plan direction.

Alternatives 1, 3, 4, and 5 manage for higher than average levels of snags and down woody material within Old Forest Emphasis and Home Range Core Areas, the land allocations managed for old forest objectives.

Fisher: Affected Environment

Species and Habitat Account

The fisher (*Pekania pennanti*, formerly *Martes pennanti pacifica*) is a Region 5 Forest Service Sensitive species and a candidate for listing under the ESA. On October 7, 2014, the U.S. Fish and Wildlife Service (FWS) announced they were proposing to list the West Coast Distinct Population Segment (DPS) as threatened under the Endangered Species Act (USFWS 2014). The West Coast Fisher DPS includes all potential fisher habitats in Washington, Oregon and California from the east side of the Cascade Mountains and Sierra Nevada to the Pacific coast. The status review and proposed listing is a result of a multidistrict litigation settlement agreement under which the Service agreed to submit a proposed rule or a not-warranted finding to the Federal Register for the West Coast DPS of the fisher no later than the end of Fiscal Year 2014 (USFWS 2013). On April 18, 2016, the FWS withdrew their proposal to list the West Coast DPS of fisher as Threatened under the ESA (USFWS 2016). They concluded that the best scientific and commercial data available indicate that the proposed West Coast DPS of fisher does not meet the statutory definition of an endangered or threatened species because the stressors potentially impacting the proposed DPS and its habitat are

not of sufficient magnitude, scope, or imminence to indicate that the DPS is in danger of extinction, or likely to become so within the foreseeable future.

Fishers have been listed with the State of California as a Species of Special Concern since at least 1986 (Williams 1986). In 2009, the California Fish and Game Commission recommended that the fisher be assessed for listing as Threatened or Endangered under the California State Endangered Species Act. Based on the recommendation CDFW conducted a 12-month review and concluded that the fisher did not merit protection under the State Endangered Species Act in 2010. An 11 March 2013 Notice of Findings stated that pursuant to court order, the FGC set aside its 15 Sep 2010 findings rejecting the petition to list, and the Pacific fisher is a candidate species for the purposes of CESA. Although they accepted additional comments regarding the status of fisher, they did not change their finding.

Fishers historically occurred in the Lassen, Plumas, Tahoe, Lake Tahoe Basin, Eldorado, Stanislaus, Sierra, and Sequoia National Forests. Zielinski and others (1995) determined that fishers remain extant in just two areas comprising less than half of the historic distribution: northwestern California and the southern Sierra Nevada from Yosemite National Park southward, separated by a distance of approximately 250 miles.

A number of southern Sierra Nevada population estimates and simulations have been conducted for fisher populations occurring across the Sequoia and Sierra National Forests, Mountain Home State Park, tribal lands, Yosemite and Sequoia/Kings Canyon National Parks. These estimates range from 100 to 600 adults (Lamberson et al. 2000, Spencer et al. 2008, and Self et al. 2008).

Status and trend monitoring for fisher and marten was initiated in 2002; the monitoring objective is to be able to detect a 20 percent decline in population abundance and habitat (USDA 2006). This monitoring includes intensive sampling to detect population trends on the Sierra and Sequoia national forests, where the fisher currently occurs, and is supplemented by less intensive sampling in suitable habitat in the central and northern Sierra Nevada specifically designed to detect population expansion. From 2002 – 2008, 439 sites were surveyed throughout the Sierra Nevada on 1,286 sampling occasions, with the bulk of the sampling effort occurring within the Southern Sierra fisher population monitoring study area (USDA 2009).

Preliminary results indicate that fishers are well-distributed in portions of the Sequoia and Sierra National Forests; annual occupancy rates are consistently higher on the Sequoia (33.3% to 41.1%) than the Sierra (14.5% to 22.7%) (USDA 2005). Comparisons to southern Sierra Nevada survey data from the 1990's suggest that the areal extent of occurrence for fisher may have expanded during the past 10 years (USDA 2005). Thus there has been no conspicuous difference in occupancy rates among years, and no seasonal effects on detection probabilities within the June to October sampling periods (Truex et al. 2009).

Carnivore cameras stations have been employed within suitable habitat in and near the analysis area in 2005-2015. No fisher detections were made as a result of these survey efforts (USDA 2015).

The project is within the historic distribution of fisher across the Sierra Nevada Bioregion. Fishers have been documented both in Yosemite National Park and south of the Merced River on the Sierra National Forest. Although their presence within the analysis area is undocumented, it is within dispersal distance of the closest known population, thus, their presence is assumed where suitable habitat exists. Because there are no documented den sites, LOPs for this species are not required for this project.

In the Sierra Nevada, fishers occur in mid-elevation forests (Grinnell et at. 1937, Zielinski et al. 1997) largely on National Forest System lands, below the elevations of most national parks and wilderness areas. In the southern Sierra Nevada, fishers occur sympatrically with martens at elevations of 5,000 to 8,500 feet in mixed conifer forests (Zielinski et al. 1995). The Sierra Nevada status and trend

monitoring project has detected fishers as low as 3,110 feet and as high as 9,000 feet in the southern Sierra Nevada, which are considered to be extremes of the elevation range for this species (USDA 2006). Male fishers have much larger home ranges than female fishers. Home range estimates for male fishers on the Sierra and Sequoia National Forests range from about 5,400 to 15,400 acres whereas female fishers range from 1,300 to3,500 acres (Mazzoni 2002, Thompson et al. 2011, Zielinski et al. 1997 and 2004c). These differences in home range size are attributed to size calculation techniques.

The following California Wildlife Habitat Relationships (CWHR) types occur in the project area and are considered important to fishers: generally structure classes 4M, 4D, 5M, 5D and 6 in ponderosa pine, montane hardwood-conifer, Sierran mixed conifer, red fir, white fir, Jeffrey pine, lodgepole pine (CDFW 2008). These are stands that are comprised of forested stands with trees greater than 12" dbh and canopy cover great than 40 percent.

Habitat connectivity across this landscape has been compromised by several large fires including the 2013 Rim Fire, the 2003 Kibbie Fire, and the 1996 Ackerson and Rogge Fires. The analysis area still contains relatively high quality habitat for fisher in areas that burned at low or low-moderate intensity such as Twomile, Bourland, and Reynolds Creek, Pilot Ridge and the Crocker Meadow area. The analysis area contains about 40,000 acres of moderate and high capability habitat on Stanislaus NFS lands only. Suitable habitat was greatly reduced in the heart of the analysis area and connectivity between large tracts of unoccupied habitat on the forest and currently occupied areas in Yosemite has been further reduced. Suitable habitat lost in the Rim Fire acres, was an area large enough to have supported up to 25 female fishers (Spencer et al. 2015). The majority of this large tract of suitable habitat and the predicted linkage area between Yosemite and the STF was rendered unsuitable based on post-fire analysis (Ibid, USDA 2014a). Spencer and others (2015) estimate that at least 14 modeled female fisher home ranges were rendered unsuitable because ≥ 50% of the area burned at high severity Figure 3.16-1 displays the pre-Rim Fire suitable female fisher home ranges modeled by Spencer and others (2015) overlaid with the high severity burn areas (greater than or equal to 50 percent basal area mortality), illustrating the need for restoring forested habitat across this landscape.

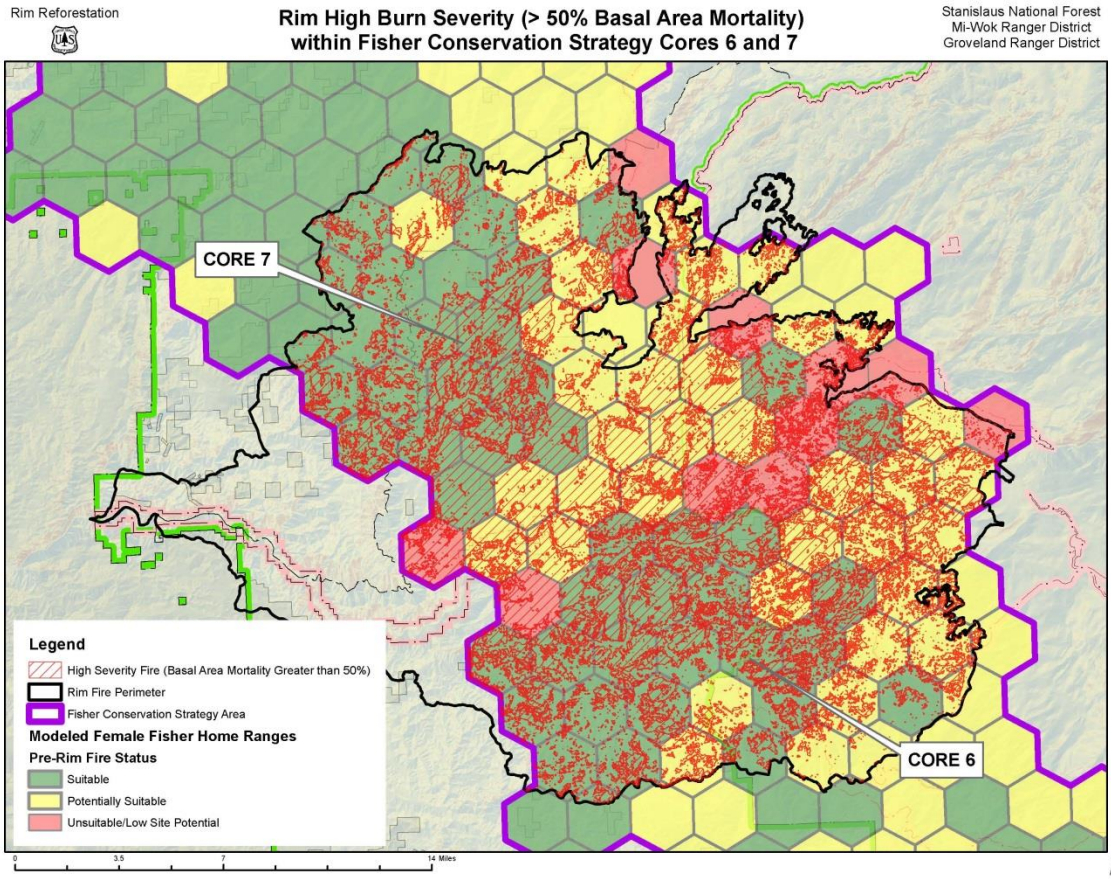

Figure 3.16-1 Pre-Rim Fire suitable female fisher home ranges as modeled by Spencer and others (2015) overlaid with the high severity burn areas (greater than or equal to 50 percent basal area mortality)

This habitat fragmentation has reduced the likelihood of fisher moving through or dispersing and settling into the area until natural vegetation recovery or forest management practices, such as planting, effectively reestablishes connectivity. There are about 72,084 acres of moderate and high capability habitat within the cumulative effects analysis area, including all ownerships. A new linkage corridor was identified that is largely intact after the Rim Fire and is located to the north, straddling Lake Eleanor and Cherry Lake, of the former linkage corridor (Ibid).

A road density of 0-0.5 miles per square mile is associated with high capability habitat for fishers (USDA 1991). A road density of 0.5-2.0 miles per square mile is associated with medium capability habitat (Ibid). The road density including all routes open to motor vehicles in the analysis area is 3.0 miles per square mile on National Forest Service lands and is more than six times the acceptable density found in high quality habitat and more than 1 mile per square mile above that found in moderate capability habitat.

Breeding occurs from late February through May, just a few days after parturition. Breeding is followed by embryonic diapause until late winter to early spring. Den site structural elements must exist in the proper juxtaposition within specific habitats in order to provide a secure environment for birth and rearing of fisher kits. Natal dens, where kits are born, are most commonly in tree cavities at heights of greater than 20 feet (Lewis and Stinson 1998). Maternal dens, where kits are raised, may be

in cavities closer to the ground so active kits can avoid injury in the event of a fall from the den (Ibid).

Truex et al. 1998, Zielinski et al. 2004a, Zielinski et al. 2006, and Purcell et al. 2009 characterize suitable habitat for denning/resting as follows:

- Canopy cover > 60%.
- Large live and dead conifers and hardwoods 21-51"dbh; showing preference for largest tree or snag in area.
- Live and snag tree basal area ranges from 100-500 ft^2/acre.

Fishers are considered prey generalists and their diet varies widely with local prey available in the diverse habitats they occupy (Zielinski and Duncan 2004b). Prey items include squirrels, voles, porcupine, snowshoe hares and reptiles (Ibid). They also readily consume hypogeous fungi, fruit and deer carrion (Ibid). While information is lacking regarding fishers use of meadows, they are known to eat meadow voles and it is likely that they forage along meadow edges as marten do.

Freel 1991 characterized highly suitable habitat for foraging as follows:

- Canopy cover >40% with a shrub component in the understory.
- Largest snags average 4-5/acre and are > 20"dbh.
- Downed logs average 4/acre and are > 30" dbh.

There is no research available regarding fisher use of high severity burn areas in the first few years after fire. Fishers have been documented in shrub habitat, but their activities and time spent in this habitat is currently unknown (Thompson pers. comm.). Although not similar to the existing condition in the project area, 2 years post-fire, Hanson (2013) did look at fisher use of un-salvaged burned and unburned forest 10-12 years post-fire. Specific vegetative conditions along sampled transects at the time of the study were not presented; only the pre-fire CWHR vegetation type, size and density class were used. Thus it is unclear what the existing vegetative conditions were at the time of the study, such as understory vegetation composition and cover. Hanson (2013) found that fisher selected mixed-conifer forest in both post-fire habitat and unburned forest 10-12 years post-fire. Although fisher did use pre-fire dense, mature forest more than expected, the results were not significant. More research is needed to clarify fisher use and the value of burned habitat for this species (Spencer et al. 2015).

Dispersal ability is low in the western population and Arthur and others (1993) suggest that short dispersal distances (up to 6-12 miles from natal home range) may be problematic in the maintenance of suitable fisher populations in areas where suitable habitat is fragmented. The current disjunct distribution pattern may also be partially attributed to movement and dispersal constraints imposed by the elongated and peninsular distribution of montane forests in the Pacific states (Wisely et al. 2004). The synergistic effect of road and rodenticide related mortalities documented in the southern Sierra populations, the apparent reluctance of fishers to cross open areas, and the more limited mobility of this terrestrial mammal relative to birds, it is more difficult for fishers to locate and occupy distant, but suitable, habitat.

Risk Factors

1. *Uncharacteristically Severe Wildfire*- High severity wildfires have been increasing in number and intensity over the past several decades and this trend is predicted to continue. For example, the Rim fire of 2013 removed 28,205 acres of moderate and high capability habitat, as defined above. Many fires within the current range of the fisher have resulted in the destruction of important denning, resting, and foraging habitat. Spencer et al. (2008) found that the short-term negative localized effects to fisher from active vegetation management designed to reduce high severity wildfire in and near suitable habitat would out-weigh the positive long-term effects of protecting suitable fisher habitat.

2. *Vegetation Manipulation to Reduce Risk of Uncharacteristically Severe Wildfire*- Aggressive stand thinning for forest health and reduced fire risk may remove important cover, snags, and vegetative diversity for fisher. These treatments may prevent more adverse effects associated with drought and wildfire, but may nonetheless leave habitat with reduced value for fisher or even render it unsuitable.
3. *Habitat Fragmentation, Loss of Connectivity*- Habitat connectivity is a key to maintaining fisher within a landscape. Activities under Forest Service control that result in habitat fragmentation or population isolation pose a risk to the persistence of fishers. Timber harvest, fuels reduction treatments, road presence and construction, and recreational activities may result in the loss of habitat connectivity resulting in a negative impact on fisher distribution and abundance.
4. *Climate Change*- Climate change is a concern for fishers because of the widespread ecological effects. There is the potential that climate change could increase habitat quality for this species, but various models and studies appear to support the idea that the core habitat for fisher in the middle elevation would suffer from fires, disease, increased pressure from lower elevation.

Management Direction

Current management direction is defined by project-level standards and guidelines from the Forest Plan (USDA 2010) and is based on the desired future condition of land allocations (Robinson 1996). The fisher is proposed for listing as threatened under the ESA, is a Region 5 Forest Service Sensitive species that is associated with old forest ecosystems (USDA 2004). The following land allocations pertain to fisher and old forest ecosystems: Protected Activity Centers (PACs), Home Range Core Area (HRCA), and Old Forest Emphasis Area (OFEA).

The desired condition for Protected Activity Centers (PAC) is to have 1) at least two tree canopy layers; (2) dominant and co-dominant trees with average diameters of at least 24 inches dbh; (3) at least 60 to70 percent canopy cover; (4) some very large snags (greater than 45 inches dbh); and (5) snag and down woody material levels that are higher than average.

The desired condition for Spotted Owl Home Range Core Area (HRCA) is to encompass the best available habitat in the closest proximity to the owl activity center (USDA 2004 ROD pp. 39-40). HRCAs consist of large habitat blocks that have: 1) at least two tree canopy layers; 2) at least 24 inches dbh in dominant and co-dominant trees; 3) a number of very large (greater than 45 inches dbh) old trees; 4) at least 50 to 70 percent canopy cover; and 5) higher than average levels of snags and down woody material.

The desired condition for Old Forest Emphasis Area (OFEA) is to provide habitat conditions for mature forest associates (northern goshawk, spotted owl, Pacific marten, and fisher). Specifically, forest structure and function across old forest emphasis areas generally resemble pre-settlement conditions.

High levels of horizontal and vertical diversity exist at the landscape-scale (roughly 10,000 acres). Stands are composed of roughly even-aged vegetation groups, varying in size, species composition, and structure. Individual vegetation groups range from less than 0.5 to more than 5 acres in size. Tree sizes range from seedlings to very large diameter trees. Species composition varies by elevation, site productivity, and related environmental factors. Multi-tiered canopies, particularly in older forests, provide vertical heterogeneity. Dead trees, both standing and fallen, meet habitat needs of old-forest-associated species. Forest structure and function generally resemble pre-settlement conditions.

Fisher: Environmental Consequences

The project alternatives could result in direct and indirect effects to the fisher through the following activities:

- Mechanical site prep for planting.

- Herbicide application for site prep and release of conifers.
- Planting and thinning conifers.

These activities may have direct and indirect effects on fisher through the following:

- Project related death, injury or disturbance.
- Project related modifications to habitat quantity or quality.

Death, injury, and disturbance

Death or injury from project related activities would be unlikely to occur given the mobility of this species. However, there is the potential for death or injury if a den or rest tree were felled while being used by fisher. Project activities, especially loud noise, could result in disturbance that may impair essential behavior patterns of the fisher related to denning, resting, or foraging. Loud noise from equipment such as chain saws or tractors is expected to occur in salvage units, project roads, and at landings. The location of fisher within the analysis area is uncertain following the Rim Fire, a large-scale disturbance event; but surveys conducted to date have resulted in no detections of fisher in the project area. This is consistent with Regional monitoring that has resulted in no detection of fisher in the project area or the Stanislaus National Forest. Temporary avoidance of the project site or displacement of individuals is expected during project implementation. Any displacement or avoidance would be of short duration and would subside shortly after project implementation activities. LOPs in place for spotted owls, goshawks, and great gray owls would afford protection to individual fisher in these areas during parturition, kit rearing, and subsequent breeding (March-August). The potential risk to individual fisher is considered low because of the lack of documented fisher occurrence within or near the analysis area.

Habitat Modification

Reforesting areas that burned at high severity would accelerate development of contiguous forested habitat, increasing the amount of habitat available and restoring connectivity across the landscape. These reforestation efforts are largely located within the Fisher Conservation Strategy Area, an area identified as an integral part of Southern Sierra Fisher Conservation and northern expansion (Spencer et al. 2015). Active or managed reforestation is predicted to provide more complex habitat conditions in the long-term. For, example, active reforestation is expected to produce more large trees (e.g., ≥ 24" dbh) and higher levels of snag recruitment when compared to the No Action Alternative. Thinning existing plantations is also expected to accelerate growth rates and increase structural stand diversity, improving foraging and breeding habitat conditions sooner than without thinning. Thinning these areas would also increase resilience when managed or wildfire returns to this landscape (Fuels, Chapter 3.05). Reducing fragmentation across the landscape and increasing the amount of interior forest is likely to increase habitat effectiveness and use by dispersing and future resident fisher. While restoring the lost habitat and linkage area near the Tuolumne Clavey River Canyons will take many decades, reforesting this area would provide long-term benefits. These benefits include; increasing habitat availability to support several breeding females and decreasing the bottleneck created by the Rim Fire where habitat and linkage between current populations in the south to suitable yet unoccupied habitat to the north is very limited.

Retention of snags and large downed woody debris is proposed under all action alternatives. Retention of snags within and near suitable fisher habitat (green forest) would provide denning and resting sites as well as habitat for prey species (Freel 1991, Thompson et al. 2011, Zielinski et al. 2004a). The number of snags and downed logs available across a fisher's home range affects the quality of that habitat for foraging and breeding. Because resting and denning structures are likely the most limiting habitat elements within fisher home ranges, retaining these elements across the landscape is critical (Ibid).

While there is no research available regarding fisher use of high severity burn areas in the first few years after fire, fishers have been documented in shrub habitat, but their activities and time spent in this habitat is currently unknown (Thompson pers. comm.). Hanson (2013) looked at fisher use in burned versus unburned habitat in the McNally and Manter fire footprints 10-12 years post-fire in an area that was not salvage logged. They report that fishers were using habitat that burned at moderate and high severity greater than 500 meters from the edge of unburned forest habitat, although these findings were not significant. The vegetative conditions at the time of this research does not mimic the existing condition within the Rim Fire area because we are looking at vegetative conditions up to two years post-fire, not 10- 12 years post-fire. Prey species that tolerate disturbance or open conditions are known to be abundant in post fire environments, such as mice, rats, chipmunks, and squirrels (Amacher et al. 2008 and Diffendorfer et al. 2012). Structural elements such as snags and downed logs, when combined with the flush of shrubs, forbs and grasses expected post-fire, could provide habitat suitable for prey and foraging habitat for fisher within a few years post-fire; however, more research is needed to clarify fisher use and the value of burned habitat for this species (Spencer et al. 2015). Reforestation efforts may result in the short-term removal of a small fraction of potential foraging habitat (i.e. burned forest in close proximity to green forest edge); however, there are currently no documented fishers in the project area and the risk of effects to individuals is considered extremely low.

Long-term, large snags and large downed logs are considered biological legacies in a post fire environment and play important roles in the structure of future forest (Lindenmayer et al. 2008). Large snags and downed logs may take hundreds of years to develop, emphasizing the need to retain these elements across the landscape. Snag fall and decay rates vary considerably by species and can remain standing for decades (Cluck and Smith 2007 and Ritchie et al. 2013). When snags eventually fall, they are incorporated as large downed logs, another critical structural element important for fisher and prey species (Freel 1991, Zielinski et al. 2004c).

Indicators

The following indicators were chosen to provide a relative measure of the direct and indirect effects to the fisher and to determine how well project alternatives comply with Forest Plan Direction and the Draft Conservation Strategy (Spencer et al. 2015).

1. Acres of future moderate and high capability habitat planted and thinned.
2. Toxicological effects from herbicide use.

These criteria were chosen based on the best available scientific literature which focuses on various aspects of fisher ecology and life history requirements. These criteria focus on those life history aspects, or habitat elements, considered most limiting to fisher persistence across their range and where project effects are expected.

Alternatives 1, 3, and 5

Because there is no difference in areas proposed for reforestation or thinning, under these three alternatives, the effects are expected to be similar and are analyzed together. The differences in herbicides proposed between Alternatives 1 and 5 versus Alternative 3 were separated below accordingly.

DIRECT AND INDIRECT EFFECTS

Indicator 1. *Reforestation (includes natural regeneration):* Habitat availability and connectivity was much reduced by the Rim Fire and the reforestation as proposed would restore a significant portion of lost habitat. Under these alternatives, there are about 23,800 acres proposed for reforestation within the Fisher Conservation Strategy Area. Planting conifers as prescribed under these alternatives would result in the restoration of moderate and high capability forested habitat across the landscape.

Reforestation under these alternatives would result in increasing the amount of moderate and high capability habitat available to fisher by 59 percent on STF lands in the long-term

Thinning: There are about 8,000 acres of existing plantation proposed for thinning within the Fisher Conservation Strategy Area. While some of these plantations are considered suitable because they are CWHR size class 4 or 5 and have greater than 40 percent canopy cover, they lack structural diversity. Thinning these plantations would promote vertical and horizontal diversity which in turn improves habitat capability. The goal is to open up these stands, creating a habitat mosaic with individual trees, clumps of trees, and openings. The ICO design would provide structural diversity where it does not currently exist. For example, the prescription calls for releasing oaks and retaining a diversity of species and sizes of residual trees. After thinning, remaining trees are expected to grow faster and understory vegetation would become established, improving habitat conditions for and their prey in the short and long-term. In addition, by breaking up the continuity of vegetation, the habitat would be more resilient when fire or other stochastic events occur.

Reforestation and thinning treatments proposed under these alternatives would start the restoration of habitat that could support several female fishers in the future. These alternatives address and maximize habitat suitability and connectivity in the long-term for fisher at home range and landscape scales, increasing connectivity within the Fisher Conservation Strategy Area Cores 6 and 7 as well as pre-fire linkage area. Although fishers have not been recently documented in the project area, benefits could be realized if and when they occupy this landscape in the future.

Indicator 2. Under Alternatives 1 and 5, herbicide use is expected to have an extremely limited potential for direct or indirect toxicological effects on fisher, as described under the herbicide risk assessment section. Because no herbicides are proposed under Alternative 3, there would be no exposure to herbicides and no direct, indirect, or cumulative toxicological effects to fisher under this alternative.

CUMULATIVE EFFECTS

The Forest queried its databases, including the Schedule of Proposed Actions (SOPA) to determine present and reasonably foreseeable future actions as well as present and reasonably foreseeable future actions on other public (non-Forest Service) and private lands (Appendix B, Rim Reforestation EIS). Some, but not all of these actions have or may contribute cumulatively to effects on fisher.

Relevant risk factors potentially affecting fisher abundance and distribution have been identified and primarily include; Loss of habitat from wildfire or vegetation treatments and habitat fragmentation or loss of connectivity. Exposure to herbicides and potential toxicological effects associated with exposure were also identified as having the potential to affect fishers. The following evaluation criteria were used as relative measures of cumulative effects from Alternatives 1, 3, and 5: habitat modification. In addition, toxicological effects were used as evaluation criteria for Alternatives 1 and 5.

Habitat Modification

Federal Lands: Present and foreseeable future activities on federal lands include: Funky Stewardship, Groovy Stewardship, Reynolds Creek Stewardship, Soldier Creek Timber Sale, Campy Timber Sale, Looney Timber Sale, Thommy Timber Sale, which are green thinning projects treating 6,546 acres of green forest across the analysis area. All snags and many declining trees will be retained unless they pose a safety hazard in these projects. The snag and declining tree retention will provide snags that could serve as potential denning or resting sites for fishers in the short-term as well as recruits for future denning or resting sites in the long-term. Other federal activities potentially impacting habitat for fishers is fuels reduction associated with the Rim Recovery project. Fuels reduction associated with this project will reduce the risk of further loss of remaining green forest within the project area.

Toxicological effects

Federal lands: There is one present federal action of herbicide use on 0.5 acres under the Rim Fire Rehabilitation project and two foreseeable federal actions of herbicide use: 8 acres under the Twomile Ecological Restoration Noxious Weed project and 23 acres associated with a special use permit for the Reliable Power Project to control vegetation under powerlines. There are no other present or foreseeable future federal actions related to herbicide use.

Private lands: Herbicide use is proposed on 1,583 acres of private land within the project area in 2017. No other present or foreseeable future actions are proposed on private lands related to herbicide application.

Alternatives 1, 3, and 5 Contribution/Summary: Alternatives 1, 3, and 5 would contribute cumulatively to short and long-term effects to fishers. Under these alternatives, reforestation on about 23,800 acres would provide the most suitable resting, denning, and foraging habitat when compared to Alternative 4. The cumulative contribution of reforestation under Alternatives 1, 3, and 5 would result in a 33 percent increase in moderate and high capability habitat available across the analysis area in the long-term. Under these alternatives about 8,000 acres of existing plantation would be thinned, promoting structural diversity and improving habitat capability in the short and long-term. These alternatives would result in similar benefits with respect to existing plantation thinning when compared to Alternative 4 because the thinning prescription is the same under all action alternatives. Alternatives 1 and 5 would contribute to the short-term limited potential of exposure to toxicity from herbicide use. Because there are no documented occurrences of fishers in the project area, it is unknown to what degree the cumulative contribution under these alternatives may affect individuals. The cumulative effects considered herein have the potential to beneficially affect the viability of this species.

Alternative 2

DIRECT AND INDIRECT EFFECTS

Indicator 1. Under No Action, death, injury or disturbance would not be an issue because no active management would occur.

The indirect effects of no action are primarily related to the influence no action may have on the amount of suitable forested habitat available to fishers in the long-term. Under this alternative, only about 9,800 acres of forested habitat is predicted to develop naturally with no active management within the Fisher Conservation Strategy Area. This would increase habitat availability across STF lands by 24 percent, almost 2/3 less than that expected under Alternatives 1, 3, and 5. Because no active management would occur, it is unknown where naturally regenerating forest would occur, how long it would take to develop, and what benefits that would provide fishers. Research and our own data from the project area show that areas in close proximity to live trees (i.e. seed source) would experience forest expansion to a limited degree, depending on the competing vegetation in the localized area (Bonnet et al. 2005). It should be noted that natural conifer expansion is sporadic in nature, could be delayed for decades due to shrub suppression, would likely be dominated by fir, and would not result in significant gains in forested habitat (Vegetation, Chapter 3.13). Areas far from seed sources would likely persist as chaparral for decades if not well over a hundred years. Existing plantations would not be thinned under this alternative; therefore, increasing structural diversity and improving habitat quality would occur. The plantations, if left untreated, could be at greater risk of loss when fire returns to this landscape because of the tightly spaced live trees and fuel loading from fire mortality (Fuels, Chapter 3.05). Habitat connectivity would not be restored in critical areas such as the Tuolumne River Canyon, which was considered the most likely route for fisher dispersal and movement between large tracts of suitable habitat to the north to south prior to the Rim Fire (Spencer et al. 2015). This alternative would result in a potential small increase in long-term habitat available to fishers on STF lands.

Indicator 2. Because no herbicides are proposed under Alternative 2, there would be no exposure to herbicides and no direct, indirect, or cumulative toxicological effects to fisher under this alternative.

CUMULATIVE EFFECTS

The cumulative effects discussion under Alternatives 1, 3, and 5 outlines those present and foreseeable future activities scheduled on public and private lands.

Alternative 2 Contribution/Summary: Under Alternative 2, no direct cumulative effect is expected because no active management would occur, however, there may be indirect consequences under this alternative primarily related to the influence no action may have on future forest development and how that may impact fishers. At the landscape scale, the cumulative contribution under this alternative would potentially increase the available suitable habitat by up to 14 percent compared to a 33 percent increase (23,800 acres) under Alternatives 1, 3, and 5. Because there are no documented occurrences of fishers in the project area, it is unknown if or to what degree the cumulative contribution under this alternative may affect individuals or the viability of this species.

Alternative 4

DIRECT AND INDIRECT EFFECTS

Indicator 1. Under Alternative 4, there are about 2,950 acres proposed for reforestation under this alternative within the Fisher Conservation Strategy Area. This is 20,850 acres less than proposed under Alternatives 1, 3, and 5. The planting prescription under this alternative is termed founder stands. This prescription calls for small variable shaped planting areas ranging from two to ten acres in size within a larger unplanted area. The unplanted area would likely be comprised of chaparral with scattered oaks. The planted area is only 20 percent of a given unit. Herbicides would be used to control shrubs and competing vegetation within planted areas and incorporating a 25 to 50 foot buffer around planted areas. These trees would be planted with a much tighter spacing, groups of 5 trees spaced 6 feet from each other. With the tighter spacing of planted trees, it may be necessary to thin the plantations around year 7 to allow growing space for the trees to mature. Prescribed fire or hand tools would be used to thin the new plantations. Prescribed fire would be applied to 50 percent of planted areas within ten years and the other 50 percent within 20 years. Reforesting in this manner would result in several small fragmented patches of forested habitat no bigger than ten acres separated by large tracts of chaparral. Small patches of forested habitat covering 20 percent of a given area would not provide the moderate and high capability habitat required by fishers, which includes large tract of contiguous forest. Similar to the No Action Alternative, about 9,800 acres of forested habitat is predicted to develop naturally with no active management across the landscape. Because no active management would occur on these acres, it is unknown where naturally regenerating forest would occur and what benefits it would provide for fishers. It is likely that areas in close proximity to live trees (i.e. seed source) would experience forest expansion to a limited degree, depending on the competing vegetation in the localized area. As stated under the No Action Alternative, natural conifer expansion is sporadic, could be delayed for decades, would likely be dominated by fir, and would not result in significant gains in forested habitat (Vegetation, Chapter 3.13). Areas far from seed sources would likely persist as chaparral for decades if not well over a hundred years. While this alternative would increase the amount of forested habitat across STF lands by up to 24 percent, it is unknown how fragmented or contiguous the distribution would be across the landscape and if it would provide benefits to fishers at the home range or landscape scale.

Thinning: There are about 8,000 acres of existing plantation proposed for thinning within the Fisher Conservation Strategy Area. Effects expected from plantation thinning are the same as those discussed under Alternatives 1, 3, and 5.

In summary, this alternative does not address or maximize habitat suitability and connectivity in the short or long-term for fishers at the home range or landscape scale. Because fishers have not been

recently documented in the project area, it is unknown if fishers would be affected by implementation of this alternative or to what degree.

Indicator 2. Herbicide use is expected to have an extremely limited potential for direct or indirect toxicological effects on fisher, as described under the herbicide risk assessment section.

CUMULATIVE EFFECTS

The cumulative effects discussion under Alternatives 1, 3, and 5 outlines those present and foreseeable future activities scheduled on public and private lands.

Alternative 4 Contribution/Summary: Alternative 4 would contribute cumulatively to short and long-term effects to fishers. Under this alternative, reforestation on up to 2,950 acres in discrete, fragmented patches is not expected to result in any measureable benefits to fishers. Reforestation and natural forest recovery under this alternative is expected to increase available habitat by up to 14 percent across the analysis area. However, this natural forest recovery is expected to be sporadic, delayed, and a limited contribution to moderate and high capability habitat in the long-term. The founder stands prescription is not expected to provide moderate and high capability habitat because it would be located in small fragmented patches separated by large tracts of chaparral. Under this alternative about 8,000 acres of existing plantation would be thinned, promoting structural diversity and improving habitat capability in the short and long-term. This alternative would result in similar benefits with respect to existing plantation thinning when compared to Alternatives 1, 3, and 5 because the thinning prescription is the same under all action alternatives. Alternative 4 would contribute to the short-term extremely limited potential of exposure to toxicity from herbicide use. Because there are no documented occurrences of fishers in the project area, it is unknown to what degree the cumulative contribution under this alternative may affect individuals. The cumulative effects considered herein would not beneficially affect the viability of this species.

Fisher: Summary of Effects

Indicator 1. Table 3.16-16 displays the number of acres proposed for reforestation (planting) and the number of acres of existing plantation proposed for thinning within the Fisher Conservation Strategy Area. Alternatives 1, 3, and 5 would provide more moderate to high capability habitat for fishers when compared to Alternative 4. Habitat provided under Alternatives 1, 3, and 5 would consist of large tracts of contiguous habitat, reducing fragmentation across the landscape. Habitat provided under Alternative 4 would be much more fragmented, reducing habitat effectiveness for fishers. All action alternatives would result in the same amount of future moderate and high capability habitat within the treated existing plantations.

Table 3.16-16 Fisher Summary of Effects

Indicator	Metric	Alternative				
		1	2	3	4	5
1. Future moderate to high capability habitat (planted or thinned)	Acres reforested[1]	23,800	0	23,800	2,950	23,800
	Acres of existing plantation thinned	8,000	0	8,000	8,000	8,000
	Total acres	**31,800**	**0**	**31,800**	**10,950**	**31,800**

[1]Includes natural regeneration

Indicator 2. Herbicide use under Alternatives 1, 4, and 5 are expected to have an extremely limited potential for direct or indirect toxicological effects on fisher because of the low Hazard Quotients related to exposure and the fact that no fishers have been documented in the project area. Because Alternative 4 has fewer acres of herbicide application proposed, the potential for effects would be less than under Alternatives 1 and 5. It is important to note that the toxicity exposure scenarios analyzed in the risk assessment show that all HQs are well below the threshold of concern, and most are several

orders of magnitude less than the threshold of concern or No Observable Adverse Effect Level. Fishers are provided an adequate margin of safety in the event that they are exposed to contaminated prey, fruit, or water.

Determination of Effects

ALTERNATIVES 1 AND 5

It is my determination that Alternatives 1 and 5 may affect but is not likely to jeopardize the continued existence of the fisher. My determination is based on the following rationale:

- These alternatives include actions to reestablish contiguous forested habitat, accelerating the time in which these areas would be suitable for resting, denning, and foraging.
- These alternatives include actions to thin existing plantations, accelerating the time in which these areas would be suitable for resting, denning, and foraging.
- Habitat connectivity would be restored under these alternatives.
- Snag retention in close proximity to green forest would result in maintaining denning and resting structures as well as habitat for prey throughout the treated areas.
- LOPs in place for wildlife associated with similar habitat under these alternatives would reduce disturbance potential to fishers.
- Toxicity exposure levels from herbicide use under these alternatives are all well below the Forest Service established threshold of concern.

ALTERNATIVE 2

It is my determination that Alternative 2 may affect but is not likely to jeopardize the continued existence of the fisher. My determination is based on the following rationale:

- This alternative would result in the smallest increase in moderate to high capability habitat available to fishers in the long-term.
- The structural diversity of existing plantations would not be promoted and thus habitat quality would not be improved in the short-term.
- Existing plantations may be at greater risk of loss when fire returns to this landscape.
- There would be no potential for exposure to herbicides.

ALTERNATIVE 3

It is my determination that Alternative 3 may affect but is not likely to jeopardize the continued existence of the fisher. My determination is based on the following rationale:

- This alternative includes actions to reestablish contiguous forested habitat, accelerating the time in which these areas would be suitable for resting, denning, and foraging.
- This alternative includes actions to thin existing plantations, accelerating the time in which these areas would be suitable for resting, denning, and foraging.
- Habitat connectivity would be restored under this alternative.
- Snag retention in close proximity to green forest would result in maintaining denning and resting structures as well as habitat for prey throughout the treated areas.
- LOPs in place for wildlife associated with similar habitat under these alternatives would reduce disturbance potential to fishers.
- There would be no potential for exposure to herbicides.

ALTERNATIVE 4

It is my determination that Alternative 4 may affect but is not likely to jeopardize the continued existence of the fisher. My determination is based on the following rationale:

- This alternative includes actions to establish small fragmented patches of forest that would not provide suitable resting or denning, or foraging habitat.

- This alternative includes actions to thin existing plantations, accelerating the time in which these areas would be suitable for resting, denning, and foraging.
- Snag retention in close proximity to green forest would result in maintaining denning and resting structures as well as habitat for prey throughout the treated areas.
- LOPs in place for wildlife associated with similar habitat under these alternatives would reduce disturbance potential to fishers.
- Toxicity exposure levels from herbicide use under this alternative are all well below the Forest Service established threshold of concern.

Fisher: Compliance with Forest Plan Direction

Applicable Forest Plan Direction

USDA 2010 p. 43: Assess the potential impact of projects on the connectivity of habitat for old forest associated species.

USDA 2010 p. 44: General guidelines for large snag retention are as follows: 1) in westside mixed conifer and ponderosa pine types – four of the largest snags per acre.

USDA 2010 p. 189: Manage HRCA for higher than average levels of snags and down woody material.

Forest Plan Compliance

THE ACTION ALTERNATIVES 1, 3, 4 AND 5 DEMONSTRATE FOREST PLAN COMPLIANCE THROUGH THE FOLLOWING

Alternatives 1, 3, and 5 address and propose actions to increase habitat connectivity.

Alternative 4 does not consider or address habitat connectivity.

Alternative 1, 3, 4, and 5 manage for the minimum levels of snags within General Forest, per guidelines in forest plan direction.

Alternatives 1, 3, 4, and 5 manage for higher than average levels of snags and down woody material within Old Forest Emphasis and Home Range Core Areas, the land allocations managed for old forest objectives.

Fisher: Consistency with the Fisher Conservation Strategy

Consistency with the Fisher Conservation Strategy

Alternatives 1, 3, and 5 manage for contiguous forested habitat and connectivity across the landscape through reforestation within about 80 years.

Alternative 4 manage for small fragmented patches of forested habitat no larger than ten acres each across the landscape within about 80 years.

Alternatives 1, 3, 4, and 5 manage for heterogeneity, promoting retention of fisher habitat elements, releasing black oaks, and increasing habitat resilience by thinning existing plantations.

Alternatives 1, 3, 4, and 5 manage for heterogeneity, planting multiple conifer species including pine, cedar, and fir, and buffering oaks when planting.

Alternatives 1 and 3 manage for heterogeneity that reflects topography, soil, and other factors highlighted in GTR 220/237 by using different prescriptions and desired conditions where appropriate on the landscape that implement these concepts.

Alternative 5 manages for heterogeneity that reflects topography, soil, and other factors highlighted in GTR 220/237 by using different prescriptions, pre-commercial thinning treatments, and desired conditions where appropriate across the landscape that implement these concepts.

Alternatives 1, 3, 4, and 5 manage to reduce hazardous fuels, increase habitat heterogeneity reflecting topography, soil, and other factors as highlighted in GTR 220/237 by thinning using the ICO concept and introducing prescribed fire to existing plantations.

Alternatives 1, 3, 4, and 5 promote retention of large trees (conifers and black oaks), snags and logs, trees clusters and gaps (ICO), and multi storied canopies in existing plantations.

Alternatives 1, 3, 4, and 5 manage to retain large snags and logs in reforestation units to contribute to the development of future forest.

Applicable Conservation Measures from the Conservation Strategy

- Objective 1.1: Increase the geographic extent of occupied fisher habitat, especially via northward expansion into currently unoccupied habitat cores.
  - Conservation Measure: Manage for increased quality and quantity of fisher habitat, and mitigate dispersal impediments.
- Objective 1.2: Maintain or increase fisher carrying capacity within each core area.
  - Conservation Measure: Manage vegetation to restore fine-scale habitat heterogeneity, promote denning habitat quality and extent, retain and recruit essential fisher habitat elements, increase and diversify the fisher prey base, promote growth and recruitment of black oaks, and increase forest resilience to climate change and disturbance events.
- Objective 2.1: Increase dispersal potential within and between core habitat areas.
  - Conservation Measure: Where site conditions permit in delineated linkage areas, maintain or increase tree canopy cover and retain and promote recruitment of downed logs, standing trees, and shrub patches to provide hiding and escape cover in non-forested portions; prevent new impediments to movement (e.g., wide openings, reservoirs); protect linkage areas from stand-replacing fire.
- Objective 3.1: Improve fisher habitat resiliency and restore fire as a key ecological process.
  - Conservation Measure: Reduce hazardous fuel conditions and increase habitat heterogeneity patterns that reflect how topography, soil, and other factors affect vegetation characteristics and fire behavior; implement ecological restoration concepts described in GTR 220/237 (North et al. 2009, 2012) to promote conditions that allow fire to serve its natural ecological role in maintaining resilient and heterogeneous forest conditions; maximize use of prescribed fire or wildfire managed for resource benefits at large scales and under conditions that promote resiliency and fisher habitat values.
- Objective 3.2: Maintain or increase important fisher habitat elements.
  - Conservation Measure: Retain and promote recruitment of large trees, coarse woody debris (large snags and logs), trees with cavities and other defects, large black oaks, dense tree clusters and gaps at fine (<0.5 ac) resolution, and clumps of multi-storied tree canopies.

Fringed Myotis, Pallid and Townsend's Big-Eared Bat: Affected Environment

Species and Habitat Accounts

The pallid bat (*Antrozous pallidus*) is a Region 5 Forest Service Sensitive species and is designated as a Species of Special Concern by CDFW. They occur in arid regions of western North America from British Columbia to Mexico and east to Wyoming (Hermanson and O'Shea 1983). They are usually found in low to mid elevation habitats below 6,000 feet; however, they have been documented up to 10,000 feet in the Sierra Nevada (USDA 2001). Considered yearlong residents, they inhabit

vegetation types such as Blue Oak Woodland, Mixed Chaparral, and coniferous forests (CDFW 2014a, Baumbach pers. obs.).

The fringed myotis (*Myotis thysanodes*) is a Region 5 Forest Service Sensitive species and is designated as a Species of Special Concern by CDFW. The fringed myotis occurs from southern British Columbia south through the western United States and most of Mexico (O'Shea and Bogan 2003). In California, it occurs from near sea level at the coast to elevations of at least 6,400 feet in the Sierra Nevada and in a variety of habitats from low desert scrub to high-elevation conifer forest (Philpott 1997). The fringed myotis is a widely distributed species, but it is considered rare (Ibid). Although this species occurs in netting and night roost surveys in a number of localities, it is always one of the rarest taxa (Pierson et al. 1996).

The Townsend's big-eared bat (*Corynorhinus towsendii*) is a Region 5 Forest Service Sensitive species and is designated as a candidate for Threatened status under the California Endangered Species Act (CESA). They occur in low desert to mid-elevation montane habitats throughout the west and are distributed from the southern portion of British Columbia south along the Pacific Coast to central Mexico and east into the Great Plains, with isolated populations occurring in the south and southeastern United States (Kunz and Martin 1982). They can be found from sea level to 10,000 feet elevation and are considered yearlong residents. Their distribution in California is strongly correlated with limestone caves, old mines, and abandoned buildings (Ibid, USDA 2001). In the Sierra Nevada, they are associated with vegetation types such as Blue Oak Woodland, Sierran Mixed Conifer, and Montane Riparian (CDFW 2008).

The status of pallid, fringed myotis and Townsend bat populations is not well researched, but all populations are thought to have declined over the past several decades (Williams 1986, Macfarlane and Angerer draft, 2013, O'Shea and Bogan 2003). Data from California suggest population declines associated with habitat loss and destruction along with disturbance at roost sites have contributed to reduced or lost occupancy at historic sites (Ibid and O'Shea and Bogen 2003, USDA 2001).

Bat surveys have been conducted in and near the analysis area. Pallid bats have been documented on the North Fork Merced River and along Cottonwood Creek (Gellman 1994, Stanislaus National Forest survey records). Fringed myotis have been documented at Fahey Pond and the Hetch-Hetchy adit at the end of road 1N45 (USDA 2015a). They have also been documented just outside the analysis area in the lower Tuolumne River and a bridge over the South Fork Tuolumne River. All documented occurrences of Townsend's big-eared bats in the vicinity of the Rim Fire were in caves, mines, and bridges (Pierson and Fellers 1998, Pierson et al. 2001). One maternity colony has been documented on the STF system lands, Bower Cave; about three miles west of the fire perimeter. Suitable roosting and foraging habitat is present throughout the project area and presence of all three species is assumed.

Pallid bats are common in open, dry habitats including grasslands, chaparral, woodlands, and coniferous forests. They roost in a variety of locations such as bridges, buildings, caves, rock crevices, mines, and trees (Hermanson and O'Shea 1983). This species can be found singly but is gregarious and can often be found roosting in groups. They are sensitive to roost site disturbance which may lead to roost abandonment. Suitable habitat is present throughout the project area. There are no barriers precluding movement (dispersal, seasonal, etc.) of this species both within and in close proximity to the project area.

In California, the fringed myotis occurs in valley foothill hardwood, hardwood conifer, and coniferous forested habitats. In mist netting surveys, they are found on secondary streams and ponds (Stanislaus National Forest survey records). They roost in caves, buildings, mineshafts, rock crevices and bridges (O'Farrell and Studier 1980). Studies conducted in California, Oregon, and Arizona, have documented that fringed myotis roosts in tree hollows, particularly in large conifer snags (Chung-MacCoubrey 1996, Rabe et al. 1998, Weller and Zabel 2001, Pierson et al. 2006). Most of the

tree roosts were located within the tallest or second tallest snags in the stand and were surrounded by reduced canopy closure (Ibid). They are gregarious and can be found roosting with other bat species, such as the long eared myotis (M. Baumbach pers. obs.). They exhibit high roost site fidelity, sometimes in different trees but within a small area (O'Farrell and Studier 1980, Weller and Zabel 2001). Fringed myotis are highly sensitive to roost site disturbance (Ibid).

Townsend's bats are uncommon and can be found in close association with limestone caves and abandoned mines. They readily forage in meadow habitat, often associated with willows (M. Baumbach pers. obs.). They can also be found in other habitats including oak woodlands, grasslands, and riparian corridors. Although documented to occasionally use basal hollows of trees in coastal forest dominated by redwood, Douglas fir, and California bay (Fellers and Pierson 2002), this has not been documented in the Sierra Nevada. Snag habitat is not considered typical roosting habitat for this species and a reduction in snag habitat has not been identified as a significant threat to this species (Philpott 1997, Region 5 species account). While they're not considered gregarious, they can be found roosting singly or together with big-eared bats and other species. There are no barriers precluding movement (dispersal, seasonal, etc.) of this species both within and in close proximity to the project area.

All three species breed in the fall with delayed implantation occurring in the spring. Females form maternity colonies in spring (Zeiner et al. 1990). Pallid bats prefer horizontally-oriented rock crevices as diurnal roost sites in the summer, which coincides with maternity colony selection and use (Hermanson and O'Shea 1983). Townsend's bats select the warm parts of caves, mines, and buildings for their maternity roosts (Kunz and Martin 1982).

Pallid bats forage in open canopied woodlands, riparian areas, and grassland or meadow habitat. They are maneuverable on the ground and commonly forage between one and five feet above the ground for prey such as Jerusalem crickets, longhorn beetles, scorpions, and occasionally large moths and grasshoppers (USDA 2001, Zeiner et al. 1990). They readily use roads, meadows, oak woodlands and other open areas to hunt.

Fringed myotis emerge from roost sites to forage approximately 1-2 hours after sunset. They forage in and among vegetation along forest edges and in the overstory canopy. They feed on a variety of insect prey, including small beetles, moths, and fly larvae caught in flight or gleened from vegetation (Ibid). Fringed myotis often forage in meadows and along secondary streams, in fairly cluttered habitat (Pierson et al. 2001). They are known to fly during colder temperatures, precipitation, and even snow (Hirshfeld and O'Farrell 1976, O'Farrell and Studier 1975, M. Baumbach pers. obs.). Keinath (2004) found that travel distances from roosting to foraging areas may be up to five miles.

Townsend's take primarily lepidopteron (moth) prey and are known as moth specialists (Kunz and Martin 1982 and Zeiner et al. 1990b). They forage along forested edges and vegetated stream corridors (Ibid).

Dispersal patterns for pallid, fringed myotis, and Townsend's bats are unknown and they aren't known to migrate long distances. Pallid bats are not known to migrate long distances. Pearson et al. (1952) documented an individual Townsend's male that travelled 20 miles. Movements between Townsend maternity colonies and hibernacula have been documented from 1.9 – 24.6 miles (Ibid). Pallid and Townsend's big-eared bats are relatively inactive and either hibernate or enter extended periods of torpor during the winter (Hermanson and O'Shea 1983, Kunz and Martin 1982). Fringed myotis are known to hibernate but are also capable of periodic winter activity (Philpott 1997).

Risk Factors

1. *White Nose Syndrome*- The largest emerging threat to all cave-roosting species is the fungal disease white-nose syndrome (WNS). Massive die-offs result once a colony is infected. Because pallid, fringed myotis, and Townsend's big-eared bats readily uses caves for roosting, they are

considerd highly susceptible to contracting WNS. Although not yet documented in California, the disease is moving to the west.

2. *Timber Harvest and loss of snags as roosting sites* - The loss of large diameter snags and live trees for roosts due to fire or harvest activities can affect roost availability for pallid bats and fringed myotis. In some forested settings, the fringed myotis appears to rely heavily on tree cavities and crevices as roost sites (Weller and Zable 2001), and may be threatened by certain timber harvest practices that result in the removal of snags. Retention of existing large trees and management of forested habitat will provide short and long-term habitat.
3. *Fire Suppression*- Pallid bats are at risk from loss of open foraging habitat from fire suppression may reduce foraging habitat in the long-term.
4. *Mining*- The resurgence of gold mining in the West potentially threatens mine dwelling bat species such as fringed myotis, pallid and Townsend's big-eared bats (Macfarlane and Angerer draft). Recreational mining exploration has resulted in an increase in roost disturbance and abandonment. Closure of old mines for hazard abatement or safety can reduce habitat availability if mines aren't closed using bat friendly gates.
5. *Rangeland management*- Pallid bats frequently forage in open areas such as oak woodlands. Fringed myotis frequently forage along riparian corridors or over meadows. Overgrazing and trampling may alter meadow hydrology or riparian ecosystems, resulting in reduced insect diversity, productivity, and reducing foraging success (Macfarlane and Angerer draft, Ferguson and Azerrad 2004).

Management Direction

The fringed myotis, pallid and Townsend's big-eared bats are all Region 5 Forest Service Sensitive species. The Forest Plan does not contain specific direction for the management of these species; however, it provides general guidance for management of Forest Service Sensitive species. This includes managing to ensure conservation or enhancement of these species' populations and habitats to prevent a trend towards Federal listing or a loss of viability. In addition, general direction in the Forest Plan to retain dead trees (snags) protects potential roosting and breeding habitat components, particularly for pallid bats and fringed myotis.

Fringed Myotis, Pallid and Townsend's Big-Eared Bat: Environmental Consequences

The project action alternatives could result in direct and indirect effects to Townsend's big-eared bats, pallid bats, or fringed myotis through the following activities:

- Mechanical site prep for planting.
- Herbicide application for site prep and release of conifers.
- Biomass removal and similar fuels treatments.
- Planting conifers.

These activities may have direct and indirect effects on these species through the following:

- Project related death, injury or disturbance.
- Project related modifications to habitat quantity or quality.

Death, injury, and disturbance

Death or injury from project related activities would be unlikely to occur given the mobility of this species. However, there is the potential for death or injury if a day roost tree were felled while being used by pallid bats or fringed myotis.

Project activities, especially loud noise, could result in disturbance to day roosting bats. Loud noise from equipment such as chain saws or tractors is expected to occur in reforestation units, project roads, and at landings. Smoke from pile or prescribed burning may also impact bats that are roosting

in close proximity to burning activities. The location of these species within the analysis area is uncertain, but presence is assumed. While these species are susceptible to disturbance at roost sites that may lead to roost abandonment, it is unlikely that females would abandon their young due to their ability to carry pups from roost to roost during normal roost-switching behavior. The tendency for bats to switch roosts under normal circumstances would preclude this from causing negative effects to reproduction. If a maternity roost is discovered, an LOP from April 1 through August 1 would be applied within 300 feet surrounding the site. LOPs in place for spotted owls, goshawks, and great gray owls would afford protection to bats roosting in these areas during pup rearing in the spring and summer months. Foraging behavior would not be affected due to their nocturnal foraging behavior.

Habitat Modification

Reforestation would result in a slight reduction of roost sites available for pallid bats and fringed myotis. However, many snags including most hardwoods snags would be retained across the treatment units that would continue to provide roosting sites. Suitable habitat outside and adjacent to treatment units would continue to provide potential roosting sites interspersed with foraging habitat in the short and long-term. Prescribed fire would likely benefit these bats, resulting in some tree mortality and snag recruitment in the short-term.

Indicators

The following indicator was chosen to provide a relative measure of the direct and indirect effects to pallid bats, Townsend's big-eared bats and fringed myotis and to determine how well project alternatives comply with Forest Plan Direction.

1. Acres of snag retention (pallid bats and fringed myotis).
2. Toxicological effects from herbicide use (pallid bats, Townsend's big-eared bats, and fringed myotis).

These criteria were chosen based on the best available scientific literature which focuses on various aspects of pallid, fringed myotis, and Townsend's big-eared bat ecology and life history requirements. They focus on those life history aspects, or habitat elements, considered most limiting to pallid bats, fringed myotis, and Townsend's big-eared bats persistence across their range and where project effects are expected.

Effects Common to Alternatives 1, 3, 5

DIRECT AND INDIRECT EFFECTS

Because there is no difference in treatment units between these alternatives, the effects are expected to be the same for Indicator 1 and are therefore analyzed together.

Indicator 1. Trees or snags with existing cavities or furrowed bark provide roosting habitat for pallid bats and fringed myotis (Pierson 1996 and Pierson et al. 2006). Suitable habitat occurs within and adjacent to treatment units under these alternatives. Hazard trees removed in green forest adjacent to reforestation areas is expected to be rare, but may result in a slight reduction of snags or roost sites available. Conifer snags would be retained at a rate of 12 to 30 square feet basal area or 4 to 6 per acre across all reforestation units. The largest size class available would be selected as the highest priority for retention and averaged across each unit, ensuring a supply of snags available throughout a given unit and the analysis area. Additionally, most hardwood snags would be retained, further contributing to important roosting habitat used by pallid bats. The hardwood and conifer snag retention across the project area would continue to provide short-term roost sites for pallid bats and fringed myotis. Trees that are declining across the project area are providing for long-term snag recruitment and are most pronounced in areas that burned at low to moderate severity, generally outside of treatment areas. Forest edges and open habitats would remain intact throughout the analysis

area and would continue to provide suitable foraging conditions for pallid bats, Townsend's big-eared bats, and fringed myotis. Alternatives 1, 3, and 5 would have negligible effects on roost site availability, foraging habitat, and foraging success for these species. There are about 30,354 acres of forested habitat within the analysis area on Stanislaus National Forest System Lands, available for bats using this landscape.

Indicator 2. Herbicide use under Alternatives 1 and 5 are expected to have some potential for direct or indirect toxicological effects on bats, as described under the herbicide risk assessment section. Because no herbicides are proposed under Alternative 3, there would be no exposure to herbicides and no direct, indirect, or cumulative toxicological effects to bats under this alternative.

CUMULATIVE EFFECTS

The Forest queried its databases, including the Schedule of Proposed Actions (SOPA) to determine present and reasonably foreseeable future actions as well as present and reasonably foreseeable future actions on other public (non-Forest Service) and private lands (Appendix B, Rim Reforestation EIS). Some, but not all of these actions have or may contribute cumulatively to effects on Townsend's big-eared, pallid bats and fringed myotis.

Risk factors potentially affecting the abundance and distribution of pallid and Townsend's big-eared bats and fringed myotis has been identified and include loss of snags as roosting sites (pallid and fringed myotis) and human disturbance at roost sites (Townsend's, pallid, fringed myotis). Exposure to herbicides and potential toxicological effects associated with exposure were also identified as having the potential to affect bats. The following relevant evaluation criteria were used as relative measures of cumulative effects from Alternatives 1, 3, and 5: habitat modification and disturbance. In addition, toxicological effects were used as evaluation criteria for Alternatives 1 and 5.

Habitat Modification

Federal Lands: Present and foreseeable future projects on federal lands include: Funky Stewardship, Groovy Stewardship, Reynolds Creek Stewardship, Soldier Creek Timber Sale, Campy Timber Sale, Looney Timber Sale, Thommy Timber Sale, which are green thinning projects treating 6,546 acres of green forest. All snags and many declining trees will be retained unless they pose a safety hazard in these projects. This snag and declining tree retention will provide snags in the short-term as well as recruit snags in the long-term. Other federal activities potentially impacting habitat for bats is the fuels reduction associated with the Rim Recovery project. Fuels reduction associated with this project will reduce the risk of further loss of remaining green forest within the project area.

Disturbance

Federal Lands: There are several sources of noise disturbance that occur throughout the forest and include activities such as timber harvest, mastication, prescribed fire operations, restoration, and recreation. These activities have occurred in the past and present and will continue into the future (Twomile, Reynolds, and Rim Fire Rehabilitation) whether or not this project is implemented. Mechanized equipment such as feller-bunchers, skidders, and chippers are used to accomplish vegetation treatments, while more manpower in the form of lighters, holders and fire engines with hose lays are used to accomplish prescribed fire operations. Under normal winter weather years, access to a large portion of the project area is restricted until late spring or early summer. The past two winters, there have been almost no restrictions on access in virtually the entire Rim Fire area. Vegetation, prescribed fire treatments could occur during the pup rearing period, potentially affecting maternity colonies. Recreation disturbance likely occurs as soon as access to an area is opened and continues to some degree until access to the area is restricted by snow in the fall or early winter. Recreation disturbance would consist of OHVs, camping, hiking, cycling, wood cutting, and passenger car driving. These effects vary in intensity, duration and scope with weekends typically being a higher use time than weekdays.

Private Lands: Noise disturbance on private lands will primarily consist of new plantation management, which could involve heavy equipment and personnel.

Toxicological effects

Federal lands: There is one present federal action of herbicide use on 0.5 acres under the Rim Fire Rehabilitation project and two foreseeable federal actions of herbicide use: 8 acres under the Twomile Ecological Restoration Noxious Weed project and 23 acres associated with a special use permit for the Reliable Power Project to control vegetation under powerlines. There are no other present or foreseeable future federal actions related to herbicide use.

Private lands: Herbicide use is proposed on 1,583 acres of private land within the project area in 2017. No other present or foreseeable future actions are proposed on private lands related to herbicide application.

Alternatives 1, 3, and 5 Contribution/Summary: Alternatives 1, 3, and 5 are expected to negligibly contribute cumulatively to effects on pallid and fringed myotis. Occasional removal of hazardous trees as a result of implementation would result in slightly fewer roost sites. Disturbance at roost sites is possible and may result in displacement of individuals or groups of roosting bats, including roost abandonment. LOPs in place near day roosts would afford protection to roosting bats, as their pup rearing season overlaps with the breeding seasons for spotted owls, goshawks, and great gray owls. Alternatives 1 and 5 would contribute to the short-term limited potential of exposure to toxicity from herbicide use. The cumulative contribution to effects on these species is considered negligible and is not expected to affect their viability.

Alternative 2

DIRECT AND INDIRECT EFFECTS

Under No Action, death, injury or disturbance would not be an issue because no active management would occur.

Indicator 1. The indirect effects of no action would result in retention of the maximum number of snags or potential roost sites across the project area. It is unknown how many additional roost sites would be retained under this alternative and what benefits would be realized by bats in the project area as a result of the availability of these additional roost sites.

Indicator 2. Because no herbicides are proposed under this alternative, there would be no exposure to herbicides and no direct, indirect, or cumulative toxicological effects to bats under this alternative.

CUMULATIVE EFFECTS

The cumulative effects discussion under Alternative 1 outlines those present and foreseeable future activities scheduled on public and private lands.

Under Alternative 2, no direct cumulative effect is expected because no active management would occur and it is unknown what indirect cumulative effects would be realized by bats on the 1,886 acres where some additional roost sites would be retained. Because no herbicides are proposed under this alternative, there would be no exposure to herbicides and therefore no cumulative toxicological effects under this alternative.

Alternative 4

DIRECT AND INDIRECT EFFECTS

Indicator 1. There is essentially no overlap (10 acres) between suitable bat habitat and planting areas under this alternative. No measureable direct or indirect effects to roost site availability or foraging habitat are expected for indicator 1 under this alternative.

Indicator 2. Herbicide use under Alternative 4 is expected to have some potential for direct or indirect toxicological effects on bats, as described under the herbicide risk assessment section.

CUMULATIVE EFFECTS

The cumulative effects discussion under Alternatives 1, 3, and 5 outlines those present and foreseeable future activities scheduled on public and private lands.

Toxicological effects

Federal lands: There is one present federal action of herbicide use on 0.5 acres under the Rim Fire Rehabilitation project. There are no other present or foreseeable future federal actions related to herbicide use.

Private lands: Herbicide use is proposed on 1,583 acres of private land within the project area in 2017. There are also 23 acres of National Forest System lands with a future special use permit proposed for herbicide use associated with the Reliable Power Project to control vegetation under powerlines have been proposed. No other present or foreseeable future actions are proposed on private lands related to herbicide application.

Alternative 4 Contribution/Summary: No cumulative effects to suitable habitat are expected from Alternative 4. Disturbance at roost sites is possible and may result in displacement of individuals or groups of roosting bats, including roost abandonment. LOPs in place near day roosts would afford protection to roosting bats, as their pup rearing season overlaps with the breeding seasons for spotted owls, goshawks, and great gray owls. Alternative 4 would contribute to the short-term limited potential of exposure to toxicity from herbicide use. The cumulative contribution to effects on these species is considered negligible and is not expected to affect their viability.

Fringed Myotis, Pallid and Townsend's Big-Eared Bat: Summary of Effects

Indicator 1. Of the action alternatives, Alternative 4 would result in the highest level of snag retention. Alternative 4 may provide the greatest benefit to pallid bats and fringed myotis amongst the action alternatives; however, it is unknown if this assumed benefit would be realized.

Indicator 2. Herbicide use under Alternatives 1, 4, and 5 are expected to have limited potential for direct or indirect toxicological effects on bats. Because Alternative 4 has fewer acres of herbicide application proposed, the potential for effects would be less than under Alternatives 1 and 5. However, it is important to note that the toxicity exposure scenarios analyzed in the risk assessment show that all but one HQ value is less than the NOAEL threshold or No Observable Adverse Effect Level. The one scenario with an HQ of 1.0 just reaches the threshold of concern, meaning there is a slightly elevated toxicological risk for bats ingesting contaminated insects. Given the foraging behavior of these species, it is unlikely that they would realize this actual level of exposure. Therefore, these species are provided an adequate margin of safety in the event that they are exposed to contaminated prey or water.

Determination of Effects

ALTERNATIVES 1 AND 5

It is my determination that Alternatives 1 and 5 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the pallid bat, Townsend's big-eared bat, or the fringed myotis. My determination is based on the following rationale:

- Snag retention would result in maintaining roosting structures throughout the treated areas.
- Foraging habitat would be available throughout the analysis area.
- Toxicity exposure levels from herbicide use under these alternatives are at or below the Forest Service established threshold of concern.

ALTERNATIVE 2

It is my determination that Alternative 2 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the pallid bat, Townsend's big-eared bat, or the fringed myotis. My determination is based on the following rationale:

- There would be no removal of snags throughout the analysis area.
- There would be no potential for exposure to herbicides.

ALTERNATIVE 3

It is my determination that Alternative 3 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the pallid bat, Townsend's big-eared bat, or the fringed myotis. My determination is based on the following rationale:

- Snag retention would result in maintaining roosting structures throughout the treated areas.
- Foraging habitat would be available throughout the analysis area.
- There would be no potential for exposure to herbicides.

ALTERNATIVE 4

It is my determination that Alternative 4 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the pallid bat, Townsend's big-eared bat, or the fringed myotis. My determination is based on the following rationale:

- There would be virtually no removal of snags throughout the analysis area.
- Foraging habitat would be available throughout the analysis area.
- Toxicity exposure levels from herbicide use under this alternative are at or below the Forest Service established threshold of concern.

Fringed Myotis, Pallid and Townsend's Big-Eared Bat: Compliance with Forest Plan

APPLICABLE FOREST PLAN DIRECTION

USDA 2010 p. 44: General guidelines for large snag retention are as follows: 1) in westside mixed conifer and ponderosa pine types – four of the largest snags per acre.

FOREST PLAN COMPLIANCE

The action alternatives 1, 3, 4 and 5 demonstrate Forest Plan compliance through the following

Alternatives 1, 3, 4, and 5 manage for at least the minimum amount of snag retention as per general guidelines in forest plan direction.

Western Bumble Bee: Affected Environment

Species and Habitat Accounts

The Western Bumble Bee (*Bombus occidentalis*) is a Region 5 Forest Service Sensitive species. The western bumble bee currently occurs on many national forests throughout California and in all states adjacent to California. Historically, the western bumble bee was one of the most broadly distributed bumble bee species in North America (Cameron et al. 2011). Currently, the western bumble bee is experiencing severe declines in distribution and abundance due to a variety of factors including diseases and loss of genetic diversity (Cameron et al. 2011, Koch et al. 2012).

The overall status of populations in the west is largely dependent on geographic region: populations west of the Cascade and Sierra Nevada mountains are experiencing dire circumstances with steeply

declining numbers, while those to the east of this dividing line are more secure with relatively unchanged population sizes. The reasons for these differences are not known.

There are no records of western bumble bee on the Stanislaus National Forest. The nearest documented western bumble bee was at Lake Eleanor in 1983, about one mile from the project area boundary (Thorp et al 1983). No surveys for western bumble bee have been conducted on the Stanislaus National Forest to date.

The project area is not known to be within the current distribution of the western bumble bee in the Sierra Nevada Bioregion. Although their presence within the analysis area is undocumented, their presence is assumed where suitable habitat exists. Habitat considered suitable in this document includes montane chaparral, mixed chaparral, annual and perennial grassland, and wet meadows. There is about 69,000 acres of suitable habitat on the STF and about 95,400 acres on STF and YNP lands. Several botanical species that are known to be utilized by the western bumble bee are found throughout the project area.

The following account of bumble bee life history is summarized from Heinrich (1979). Queens overwinter in the ground in abandoned rodent (e.g., mouse, chipmunk or vole) nests at depths from 6-18 inches and typically emerge about mid-March. The queen then lays fertilized eggs and nurtures a new generation. She first creates a thimble-sized and shaped wax honey pot, which she provisions with nectar-moistened pollen for 8-10 individual first-generation workers when they hatch. The larvae will receive all of the proteins, fats, vitamins and minerals necessary for growth and normal development from pollen. Eventually all the larvae will spin a silk cocoon and pupate in the honey pot. The workers that emerge will begin foraging and provisioning new honey pots as they are created to accommodate additional recruits to the colony. Individuals emerging from fertilized eggs will become workers that reach peak abundance during July and August. Foraging individuals are largely absent by the end of September. Those that emerge from unfertilized eggs become males, which do not forage and only serve the function of reproducing with newly emerged queens. During the season, a range of 50 to hundreds of individuals may be produced depending on the quantity and quality of flowers available. When the colony no longer produces workers, the old queen will eventually die and newly emerged queens will mate with males and then disperse to found new colonies. During this extended flight that may last for up to two weeks she may make several stops to examine the ground for a suitable burrow.

Unlike all other bees, bumble bees are large enough to be capable of thermoregulation, which allow them to maintain their foraging activities for longer periods of the day, but also to occupy regions with more extreme latitudes and temperatures compared to other bees (Heinrich 1979). Bumble bees may continue to forage when temperatures are below freezing even in inclement weather (Heinrich (1979).

Queens end the year by locating a sheltering burrow, where they may spend the winter months under cover. Where nesting habitat is scarce, bumble bee species having queens that emerge early (mid-March) in the season like *B. vosnesenskii* which co-occurs with the later emerging *B. occidentalis*, may be able to monopolize available nest sites and reduce the chances of success for bumble bee species emerging later.

Bumble bees are central place foragers, meaning individuals rely on exploration to find resources (Osborne et al. 2008). Bees may communicate with chemical cues to fellow nest mates signaling the presence of a good food source (Dornhaus and Chittka 2001 and Dornhaus and Chittka 2004). The western bumble bee is a generalist forager, meaning they do not rely on any one flower or flower type. However, they have a short proboscis or tongue length relative to other co-occurring bumble bee species, which restricts nectar gathering to flowers with short corolla lengths and limits the variety of flower species it is able to exploit.

Risk Factors

1. *Non-native bumble bee species introductions*- Bumble bees introduced from Europe for commercial pollination apparently carried a microsporidian parasite, *Nosema bombi*, which has been introduced into native bumble bee populations. Highest incidences of declining *B. occidentalis* populations are associated with highest infection rates with the *Nosema* parasite, and the incidence of *Nosema* infection is significantly higher in the vicinity of greenhouses that use imported bumble bees for pollination of commercial crops (Cameron et al. 2011).
2. *Grazing*- According to studies done in England (Goulson et al. 2008), grazing during the autumn and winter months may provide excellent bumble bee habitat and prevent the accumulation of coarse grasses. Heavy grazing and high forage utilization should be avoided since flowering plants providing necessary nectar and pollen may become unavailable, particularly during the spring and summer when queens, workers and males are all present and active.
3. *Habitat fragmentation and alteration*- Bumble bees are threatened by many kinds of habitat alterations that may fragment or reduce the availability of flowers that produce the nectar and pollen they require, and decrease the number of abandoned rodent burrows that provide nest and hibernation sites for queens. In the absence of fire, native conifers encroach upon meadow habitat, which also decreases foraging and nesting habitat available for bumble bees.
4. *Development*- Major threats that alter landscapes and habitat required by bumble bees include agricultural and urban development. Exposure to organophosphate, carbamate, pyrethroid and particularly neonicotinoid insecticides has recently been identified as a major contributor to the decline of many pollinating bees, including honey bees and bumble bees (Henry et al. 2012, Hopwood et al. 2012, Krupke et al. 2012).

Management Direction

The western bumble bee was designated as a Region 5 Forest Service Sensitive species in 2013. Thus, the Forest Plan does not contain specific direction for the management of this species; however, it provides general guidance for management of Forest Service Sensitive species. This includes managing to ensure conservation or enhancement of these species' populations and habitats to prevent a trend towards Federal listing or a loss of viability.

Western Bumble Bee: Environmental Consequences

The project action alternatives could result in direct and indirect effects to the western bumble bees through the following activities:

- Mechanical site prep for planting.
- Herbicide application for site prep and release of conifers.
- Biomass removal and similar fuels treatments.
- Planting conifers.

These activities may have direct and indirect effects on western bumble bees through the following:

- Project related death, injury or disturbance.
- Project related modifications to habitat quantity or quality.

Death, injury, and disturbance

Death or injury from project related activities could occur because this species nests and over winters underground in abandoned rodent burrows.

Project activities, such as heavy equipment use for site prep, are expected to occur in thinning and reforestation units, project roads, and at landings. Ground disturbance from reforestation activities is likely to result in mortality and loss of any bee colony or overwintering queens in the area (Hatfield et al. 2012). Prescribed burning is also expected to occur in units and landings and could result in injury or death of overwintering queens if the nest is not deep enough to withstand the residual heat at the

soil surface. Because there are no occurrence records on the forest or in the project area, the potential risk for death or injury is unknown.

Habitat Modification

Reforestation, thinning, and prescribed fire activities is expected to alter, fragment, and reduce bee habitat availability across the project area in the short-term (about 10-12 years). Reforestation and prescribed fire would reduce or remove forage through direct mortality of floral resources. Management activities should be aimed at improving diverse assemblages of primarily native flora and keeping undisturbed areas, such as logs, clumps of grass, and floral resources constantly available throughout the year so bees can find nesting, foraging, and overwintering sites (Blake et al. 2011). Assuring continuity of nectar and pollen resources when bees are active from spring to late summer is also recommended to mitigate project effects to bees (Schweitzer et al. 2012). Snag and downed log retention throughout the project area combined with oak buffers, small pockets of understory vegetation in planting units, and untreated areas, would provide short-term native plant cover and nesting or overwintering habitat for bees during project implementation. Thinning existing plantations is expected to result in a more open understory and recruitment of herbaceous vegetation which could benefit the bee following treatment (USDA/USDI 2015). Prescribed fire treatments do not typically result in 100 percent consumption of vegetation. Prescriptions call for a mosaic burn in which some vegetation is left intact. Therefore, herbaceous and woody vegetation would remain available to some extent in treated areas for bees.

Indicators

The following indicator was chosen to provide a relative measure of the direct and indirect effects to the western bumble bees and to determine how well project alternatives comply with Best Management Practices for Federal lands.

1. Habitat modification.
2. Toxicological effects from herbicide use.

These criteria were chosen based on the best available scientific literature which focuses on various aspects of western bumble bee ecology and life history requirements. These criteria focus on those life history aspects, or habitat elements, considered most limiting to western bumble bee persistence across suitable habitat and where project effects are expected.

Alternatives 1, 3, and 5

DIRECT AND INDIRECT EFFECTS

Because there is very little difference in the site prep, prescriptions, and plantation release results, the effects expected to be similar under these three alternatives and are analyzed together. The differences in herbicides proposed between Alternatives 1 and 5 versus Alternative 3 were separated below accordingly.

Indicator 1. *Reforestation (includes natural regeneration):* Under these alternatives about 26,600 acres of suitable habitat is proposed for reforestation. Ultimately this would result in up to a 39 percent reduction in the amount of suitable habitat across the project area. Site prep is designed to eliminate competing vegetation from the planting areas, although this doesn't occur on every acre. This would be accomplished through deep tilling or herbicide application or a combination of both. The effects are the same, reduced habitat available for bees during implementation and management for the short-term (10-12 years). Implementation will be phased over several years and each unit includes areas where site prep, herbicide application, and planting treatments would not occur. It is in these areas that suitable habitat would be retained.

Several design criteria would result in the retention of bee habitat in any given unit and across the entire project area. Sensitive and Watchlist plant sites would have buffers applied and would not be

reforested, offering foraging opportunities for bees. In reforestation units, up to five oaks would be buffered and no reforestation or release treatments would occur within 20 feet of these oaks. This would provide up to 15 percent of any given acre that would contain habitat for bees. Up to 20 percent vegetative cover is also retained on each acre in reforestation units before release treatments are triggered. This would provide up to an additional 20 percent of a given acre that would contain habitat for bees. When combined, up to 35 percent of any given acre proposed for treatment could contain native floral resources available to bees. Areas where snags and downed logs are retained would also provide potential nesting or overwintering sites. While it is not known how much of these untreated areas would contain flowering plants utilized by bees, it is assumed that at least some portion would be suitable for foraging. Bumble bees have been documented to fly up to 0.9 miles from their nest site to foraging habitat (Osborne et al. 2008). Osborne and others (2008) found that the energetic cost of travelling from 0.08 miles to 0.9 miles to a foraging site did not appear to be prohibitive compared to the rewards gained (i.e., nectar and pollen). Cresswell and others (2000) used realistic parameters for time and energy expenditure to predict if foraging resources were inadequate that bumble bees could forage profitably at distances greater than 2.5 miles. Given the design criteria and potential for foraging habitat retention throughout the project area, it is unlikely that individuals would need to travel these distances to find foraging habitat.

Prescribed fire would be introduced to new plantations within 10 years of planting. USDA/USDI (2015) recommends implementing prescribed burning operations in the late fall to early spring and early or late in the day to mitigate some negative effects to bees. They also suggest leaving small unburned patches within burned areas to ensure that some flowers are always available. Prescribed burns are most often implemented fall through spring when the weather conditions are conducive with the burning prescription. This timeframe would ensure that the blooming period for many plants is avoided. While some habitat would be removed in the short-term, burning prescriptions include the objective of retaining patches of vegetation (i.e., suitable habitat) across the treatment area. Retaining open stand conditions using prescribed fire would also result in the long-term benefit of retaining suitable bee habitat.

Forested habitat was not identified as suitable habitat when calculating acres for this analysis; however, open canopied forests contain understory vegetation that would benefit bees (USDA/USDI 2015). There are 10,800 acres proposed for planting with the open canopy mosaic prescription and are located throughout the landscape. Therefore 12,200 acres out of the 26,600 proposed for reforestation are still expected to provide landscape level habitat benefits to bees (Ibid).

Thinning: Under these alternatives about 5,400 acres of existing plantation is proposed for thinning and creating an open canopy mosaic. Thinning existing plantations would result in opening up the understory promoting the recruitment of herbaceous vegetation within a year or two post treatment which would benefit bees in these areas (Schweitzer et al. 2012, USDA/USDI 2015). The goal is to open up these stands, creating a habitat mosaic with individual trees, clumps of trees, and openings. After thinning, remaining trees are expected to grow faster and understory vegetation would become established, providing habitat for bumble bees in the short and long-term. The short-term impacts to forage availability and potential loss of nest or overwintering sites would be outweighed by the short and long-term benefits realized by implementing these alternatives. While these units are classified as forested habitat, the open canopy desired condition in these units is expected to provide landscape level habitat benefits to bees (Ibid).

Indicator 2. Herbicide use under Alternatives 1 and 5 are expected to have some potential for direct or indirect toxicological effects on bees, as described under the herbicide risk assessment section. Because no herbicides are proposed under Alternative 3, there would be no exposure to herbicides and no direct, indirect, or cumulative toxicological effects to bees under this alternative.

CUMULATIVE EFFECTS

The Forest queried its databases, including the Schedule of Proposed Actions (SOPA) to determine present and reasonably foreseeable future actions as well as present and reasonably foreseeable future actions on other public (non-Forest Service) and private lands (Appendix B, Rim Reforestation EIS). Some, but not all of these actions have or may contribute cumulatively to effects on western bumble bees.

Relevant risk factors potentially affecting western bumble bee abundance and distribution have been identified and primarily include habitat fragmentation and alteration. Exposure to herbicides and potential toxicological effects associated with exposure were also identified as having the potential to affect bees. The following relevant evaluation criteria were used as relative measures of cumulative effects from Alternatives 1, 3, and 5: habitat modification. In addition, toxicological effects were used as evaluation criteria for Alternatives 1 and 5.

Habitat modification

Federal Lands: Present and foreseeable future activities on federal lands include: meadow restoration (Reynolds Creek, Rim Fire Habitat Improvement and Rehabilitation, and Twomile meadow restoration). Other federal activities potentially impacting habitat for bees is grazing.

Meadow restoration projects are expected to improve foraging habitat across about 180 acres for bees. By removing encroaching conifers and improving hydrologic function of meadows on this landscape, native flora and habitat suitability in these meadows would increase forage availability for bees.

Grazing is occurring and will continue to occur across the analysis area whether or not this project is implemented. Grazing and high forage utilization should be avoided since flowering plants providing necessary nectar and pollen may become unavailable, particularly during the spring and summer when queens, workers and males are all present and active. Grazing is subject to utilization standards in the SNFPA (USDA 2004) that protect resources such as meadow habitat.

Private Lands: There are about 1,583 acres of herbicide application on private lands in the foreseeable future across the analysis area. The near complete coverage of most acres across private lands has resulted in almost complete removal of foraging habitat for bees. These areas will likely not provide foraging habitat for bees for several years.

Toxicological effects

Federal lands: There is one present federal action of herbicide use on 0.5 acres under the Rim Fire Rehabilitation project and two foreseeable federal actions of herbicide use: 8 acres under the Twomile Ecological Restoration Noxious Weed project and 23 acres associated with a special use permit for the Reliable Power Project to control vegetation under powerlines. There are no other present or foreseeable future federal actions related to herbicide use.

Private lands: Herbicide use is proposed on 1,583 acres of private land within the project area in 2017. No other present or foreseeable future actions are proposed on private lands related to herbicide application.

Alternatives 1, 3, and 5 Contribution/Summary: Alternatives 1, 3, and 5 would contribute cumulatively to short and long-term effects to western bumble bees. Reforestation would result in modification of about 39 percent of suitable habitat on STF lands and about 28 percent of suitable habitat across the analysis area. Although suitable habitat would be altered, several design elements included in prescriptions under these alternatives would ensure habitat is available throughout the project area during implementation. Thinning of existing plantations would result in more open stand conditions increasing the amount of herbaceous and woody vegetation available as forage to bees across six percent of the analysis area. Using prescribed fire is expected to help create and maintain these conditions. These alternatives would result in the most suitable habitat modified when compared to

Alternative 4. Alternatives 1 and 5 would contribute to the short-term potential of exposure to toxicity from herbicide use. Because there are no documented occurrences of western bumble bees on the STF, it is unknown to what degree the cumulative contribution under these alternatives may affect individual bees or the viability of this species.

Alternative 2

Under No Action, death, injury or disturbance would not be an issue because no active management would occur.

Indicator 1. The indirect effects of no action would likely benefit the western bumble bee. The early seral habitat present across the landscape would provide additional food, nesting, and overwintering resources to bees in the short-term. Over time, the shrubs will become dense thickets, eliminating essential forbs an important food source for bees. This may affect habitat suitability for bees across the landscape long-term. When wildfire returns, it will reset the clock beginning with the flood of herbaceous vegetation that is most valuable for bees.

Indicator 2. Because no herbicides are proposed under this alternative, there would be no exposure to herbicides and no direct, indirect, or cumulative toxicological effects to bees under this alternative.

CUMULATIVE EFFECTS

The cumulative effects discussion under Alternatives 1, 3, and 5 outline those present and foreseeable future activities scheduled on public and private lands.

Under Alternative 2, no direct cumulative effect is expected because no active management would occur; however, the indirect effects under this alternative would result in additional resource and habitat availability for bees in the short-term. Because there are no documented occurrences of western bumble bees on the STF, it is unknown to what degree the cumulative contribution under this alternative may affect individual bees or the viability of this species.

Alternative 4

DIRECT AND INDIRECT EFFECTS

Indicator 1. *Reforestation:* Under Alternative 4, up to 2,950 acres of suitable habitat is proposed for reforestation. Up to 4,130 acres of suitable habitat would be subject to site prep and release treatments (founder stands and the 50 foot buffer around each founder stand). This would result in up to a six percent decrease in the amount of suitable habitat across the project area on STF lands. Site prep is designed to eliminate competing vegetation from the planting areas. This would be accomplished through deep tilling or herbicide application or a combination of both. The effects are the same, reduced habitat available for bees during implementation and management for the short-term (10-12 years). Implementation would be phased over several years and each unit includes areas where site prep, herbicide application, and planting treatments would not occur. It is in these areas that suitable habitat would be retained.

Design criteria for reforestation described under Alternatives 1, 3, and 5 are also applicable under this alternative. In addition to the standard design criteria, there would be no planting within 200 feet of any sensitive plant site or within complex early seral habitat, both which provide habitat to bees.

Prescribed fire would be introduced to 50 percent of new plantations within 10 years and the other 50 percent between 10 and 20 years. The same burning prescriptions and expected retention of habitat discussed under Alternatives 1, 3, and 5 would apply under this alternative on a smaller scale.

Forested habitat was not identified as suitable habitat when calculating acres for this analysis; however, open canopied forests contain understory vegetation that would benefit bees (USDA/USDI 2015). There are 2,950 acres proposed for planting with an ultimate goal of being open canopy.

Therefore the areas proposed for reforestation are still expected to provide some habitat benefits to bees (Ibid).

Thinning: Because prescriptions for thinning existing plantations under this alternative are the same as described under Alternatives 1, 3, and 5, the effects are expected to be the same, see discussion under Alternatives 1, 3, and 5.

Indicator 2. Herbicide use under Alternative 4 is expected to have some potential for direct or indirect toxicological effects on bees, as described under the herbicide risk assessment section.

CUMULATIVE EFFECTS

The cumulative effects discussion under Alternatives 1, 3, and 5 outline those present and foreseeable future activities scheduled on public and private lands.

Alternative 4 Contribution/Summary: Alternative 4 is expected to contribute cumulatively to effects on western bumble bees. Under this alternative, minor cumulative effects are expected from reforestation. Suitable habitat would be altered on up to four percent of the analysis area. Cumulative effects from thinning existing plantations are expected to be the same as described under Alternatives 1, 3, and 5. Alternative 4 would contribute to the short-term potential of exposure to toxicity from herbicide use. Because there are no documented occurrences of western bumble bees on the STF, it is unknown to what degree the cumulative contribution under this alternative may affect individual bees or the viability of this species.

Western Bumble Bee: Summary of Effects

Indicator 1. Of the action alternatives, Alternative 4 would result in the least amount of suitable habitat modification when compared to Alternatives 1, 3, and 5. Effects of thinning existing plantations would be the same among all action alternatives.

Table 3.16-17 Western Bumble Bee Summary of Effects

Indicator	Metric	Alternative				
		1	2	3	4	5
1. Habitat modification[1]	Acres of habitat modified	26,600	0	26,600	4,130	26,600
	Percent of habitat modified	39	0	39	6	39

[1]Stanislaus National Forest lands only

Indicator 2. Herbicide use under Alternatives 1, 4, and 5 are expected to have the potential for direct or indirect toxicological effects on bees. Because Alternative 4 has fewer acres of herbicide application proposed, the potential for effects would be less than under Alternatives 1 and 5. However, it is important to note that the toxicity exposure scenarios analyzed in the risk assessment show that all HQ values for clopyralid, aminopyralid, and clethodim are several orders of magnitude less than the NOEC threshold or No Observable Effect Concentration. The HQ values for the glyphosate scenarios of ingesting contaminated vegetation were slightly above the NOAEL threshold or No Observable Adverse Effect Level. They HQ values were 1.7 and 3.0, indicating an elevated toxicological risk for individual western bumble bees. Given the fact that most glyphosate spraying would occur before plants are flowering and no western bumble bees have been documented on the STF, it is unlikely that bees would realize this actual level of exposure. Therefore, this species is provided an adequate margin of safety in the event that they are exposed to direct spray or contaminated vegetation.

Determination of Effects

ALTERNATIVES 1 AND 5

It is my determination that Alternatives 1and 5 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the western bumble bee. My determination is based on the following rationale:

- Foraging, nesting, and overwintering habitat would be available throughout the analysis area in the short and long-term.
- Most toxicity exposure levels from herbicide use under these alternatives are all several orders of magnitude below the Forest Service established threshold of concern.

ALTERNATIVE 2

It is my determination that Alternative 2 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the western bumble bee. My determination is based on the following rationale:

- There would be no modification of currently suitable habitat.
- There would be no potential for exposure to herbicides.

ALTERNATIVE 3

It is my determination that Alternative 3 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the western bumble bee. My determination is based on the following rationale:

- Foraging, nesting, and overwintering habitat would be available throughout the analysis area in the short and long-term.
- There would be no potential for exposure to herbicides.

ALTERNATIVE 4

It is my determination that Alternative 4 may affect individuals but is not likely to result in a trend toward Federal listing or loss of viability for the western bumble bee. My determination is based on the following rationale:

- Foraging, nesting, and overwintering habitat would be available throughout the analysis area in the short and long-term.
- Most toxicity exposure levels from herbicide use under these alternatives are all several orders of magnitude below the Forest Service established threshold of concern.

Western Bumble Bee: Compliance with Forest Plan and Pollinator-Friendly Best Management Practices for Federal Lands

The Forest Plan does not contain specific direction for the management of this species; however, it provides general guidance for management of Forest Service Sensitive species. This includes managing to ensure conservation or enhancement of these species' populations and habitats to prevent a trend towards Federal listing or a loss of viability.

FOREST SERVICE SENSITIVE SPECIES CONSERVATION

Action alternatives 1, 3, 4 and 5 demonstrate Forest Service Sensitive species conservation goals through the following:

Alternatives 1, 3, 4, and 5 maintain suitable habitat within or adjacent to treatment units throughout the project area both during and after implementation.

POLLINATOR-FRIENDLY BEST MANAGEMENT PRACTICES FOR FEDERAL LANDS:

Action alternatives 1, 3, 4 and 5 demonstrate Pollinator-Friendly Best Management Practices through the following:

Alternatives 1, 3, 4, 5 would target use of prescribed fire between fall and spring, maintain suitable foraging, nesting, and overwintering habitat throughout the project area, apply herbicides in early spring before most flowering plants bloom, and use low pressure backpack sprayers effectively reducing the risk of drift.

Black-Backed Woodpecker: Affected Environment

Species and Habitat Account

The black-backed woodpecker (*Picoides arcticus*) is not designated as a Region 5 Forest Service Sensitive species. They are currently listed as a Management Indicator Species (MIS) representing the ecosystem component of snags in burned forests, as described in the Rim Reforestation MIS report available in the project record.

Black-backed woodpeckers are distributed in boreal regions from south-central Alaska across Canada to Newfoundland and Nova Scotia, and south in the western United States in Montana and Washington through east-central California (Region 5 Sensitive species evaluation form for black-backed woodpecker 2012). The black-backed woodpecker is a monotypic species that occurs at elevations of 1200-3000 m (4,000-10,000 ft.) in the Siskiyou, Warner, and Shasta counties, the Sierra Nevada Mountains of California and Nevada south to the southern limits of Tulare County in Sequoia National Forest (Ibid).

Black-backed woodpeckers are still distributed across their historical breeding range in California (Bond et al. 2012). They have been documented within the Rim Fire perimeter in both 2014 and 2015, but in low numbers (White pers. comm.).

In December 2011, the California Fish and Game Commission accepted for consideration a petition submitted by the John Muir Project and the Center for Biological Diversity (Hanson and Cummings 2010) to list the black-backed woodpecker (*Picoides arcticus*) as Threatened or Endangered under the California Endangered Species Act. The Commission's December 15, 2011 action conferred on the species the interim designation of "candidate for listing", effective January 6, 2012, and gave the California Department of Fish and Game (now California Department of Fish and Wildlife or CDFW) 12 months from that date to review the petition, evaluate the available information, and report back to the Commission whether or not the petitioned action is warranted. In May 2013, the Fish and Game Commission found listing the black-backed woodpecker as Threatened or Endangered under CESA was not warranted (Bonham 2013).

The Commissions conclusion that the black-backed woodpecker's was based on the following summary (Bonham 2013):

- The lack of an apparent range retraction or changes in distribution within the range.
- The episodic cycles of high density occurrences (i.e., prey invasion, high woodpecker productivity, prey decline, and woodpecker dispersal) and the lack of current data on the cycle's impact on the long-term viability of California's black-backed woodpecker population.
- The lack of data concerning the role of green forest on the species but its apparent use as habitat.
- The trending increase in fire frequency, size, and severity as compared to the early and mid-20th century.
- Uncertainty regarding the magnitude of the threat posed to black-backed woodpeckers by post-fire salvage logging.
- Lack of logging on approximately 80% of severely burnt USFS forest habitat since 2003 (i.e., 87,200 acres).
- The ongoing long-term monitoring of the species as an MIS.

- Black-backed woodpecker populations in California are not geographically isolated from populations in adjacent states.

Having considered these factors, the Department concluded that the best available scientific information available to the Department does not indicate that the black-backed woodpecker's continued existence is in serious danger or is threatened by any one or any combination of the following factors found in relevant regulation: present or threatened modification or destruction of black-backed woodpecker habitat, overexploitation, predation, competition, disease, or other natural occurrences or human-related activities. (Cal. Code Regs., tit 14, § 670.1 (i)(1)(A)). Therefore, based upon the best scientific information available to the Department, listing the black-backed woodpecker as threatened or endangered is not warranted.

A consortium of environmental groups including the John Muir Project, the Center for Biological Diversity, the Blue Mountains Biodiversity Project, and the Biodiversity Conservation Alliance filed a petition (Hanson et al. 2012) to list the Oregon/California and Black Hills (South Dakota) populations of the black-backed woodpecker as Threatened or Endangered under the Federal Endangered Species Act. The U.S. Fish and Wildlife Service prepared a 90-day finding indicating that the petitioned action may be warranted based on the information provided by the petitioners; therefore when funds become available, they will initiate a review of the status of the two populations to determine if listing either or both the Oregon Cascades-California population and the Black Hills population as either subspecies or Distinct Population Segments is warranted (USFWS 2013a). Currently, the USFWS website says this species is under review.

The IUCN Red List of Threatened Species evaluated the black-backed woodpecker as a species of "Least Concern" in 2012 (http://www.iucnredlist.org/details/22681181/0). IUCN provided justification for this evaluation as follows: "This species has an extremely large range, and hence does not approach the thresholds for Vulnerable under the range size criterion (Extent of Occurrence <20,000 km2 combined with a declining or fluctuating range size, habitat extent/quality, or population size and a small number of locations or severe fragmentation). The population trend appears to be stable, and hence the species does not approach the thresholds for Vulnerable under the population trend criterion (>30% decline over ten years or three generations). The population size is extremely large, and hence does not approach the thresholds for Vulnerable under the population size criterion (<10,000 mature individuals with a continuing decline estimated to be >10% in ten years or three generations, or with a specified population structure). For these reasons the species is evaluated as Least Concern".

NatureServe has ranked this species as G5 = demonstrably secure at the Global level and N4 = apparently secure at the National level (NatureServe.org). The state/province threat status indicates the California ranking is S3/S4 (vulnerable/apparently secure). The current CDFW current ranking for black-backed woodpeckers is S2 (imperiled).

Population trends of black-backed woodpeckers are poorly known (Bond et al. 2012). Such analyses are especially difficult for this species due to the ephemeral nature of the woodpecker's burned habitat, its tendency not to re-use nesting cavities in subsequent years, and the low density at which the species occurs in unburned forests (Ibid). Inclusion of black-backed woodpecker monitoring in the Forest Service's MIS program for 10 national forest units in California, as well as additional research, should yield trend information for the species in burned forests of the Sierra Nevada and southern Cascades in the coming years (Siegel et al. 2008, 2010, 2011, 2012, 2015; Saracco et al. 2011). According to Siegel et al. (2015), "there is no evidence for a trend in fire-level occupancy by black-backed woodpeckers, but there is marginal evidence of a negative linear trend in point-level occupancy, amounting to an annualized loss of 1.35% of points per year during the six years (2009-2014) we have been monitoring black-backed woodpeckers on National Forests in California.

Although the distribution of the species appears to change slightly from year to year, black-backed woodpeckers remain present across their historic range in California" (p. 39).

Trend information available from Breeding Bird Surveys (BBS) is available; however, these trend estimates were based on observations along only five BBS routes. Trends in black-backed woodpecker populations according to BBS data throughout the species range were non-significantly positive between 1966 and 2007 but significantly negative (minus 7% per year) between 1980 and 2007. Within the Sierra Nevada Physiographic Province, including most of the species range in Region 5, trends were non-significantly negative during both 1966-2006 and 1980-2006. Thus, black-backed woodpecker trends are not well-monitored by the BBS methodology, due to its patchy distribution and low detection probability during passive point counts (Region 5 Sensitive species evaluation form for black-backed woodpecker 2012).

The number of black-backed woodpeckers occupying recent fire areas that burned from 2000 to 2010 in the Sierra Nevada appears not to exceed several hundred pairs (Bond et al. 2012). Population estimates in 'green' forests of the Sierra Nevada range from several hundred to several thousand pairs (Ibid).

The analysis area is within the current distribution of black-backed woodpeckers across the Sierra Nevada Bioregion. Prior to the Rim Fire, there were very few acres of burned forest suitable for black-backed woodpeckers within the Rim Recovery analysis area. Exact acres could not be calculated because snag retention from previous fires and the associated projects were based on numbers of snags, not acres of snag patches. However, only low snag densities were retained and many of those snags have likely fallen. Therefore it is reasonable to assume that there were very few acres, if any, of burned forest suitable for black-backed woodpeckers prior to the Rim Fire. The project contains suitable habitat for this species and presence has been documented in various locations throughout the fire area (White pers. comm., pers. obs.).

The black-backed woodpecker is strongly associated with burned forests, more closely than any other western bird species (Hutto1995, Hutto 2008, Bond et al. 2012). Although the black-backed woodpecker is found in unburned forested stands throughout its range, population densities in recently burned forest stands are substantially higher (Hutto 1995, Hoyt and Hannon 2002, Smucker et al. 2005, Hutto 2008, Fogg et al. 2012). During broadcast surveys for black-backed woodpeckers in burned forests throughout the Sierra Nevada, southern Cascades, and Warner mountains in 2009 and 2010, 95% of detections were between 1,461 and 2,596 m (4,793 – 8,517 ft.) above sea level (R. Siegel unpublished data). Survey stations above 2,800 m (9,186 ft.) have not been established, so the upper boundary of the range of detection may be higher than currently documented. Black-backed woodpecker home-ranges are highly variable and are shown to range from 24-304 hectares (59-751 acres) (Siegel pers. comm.; Siegel et al. 2013, 2014, Tingley et al. 2014b). Snag basal area alone best predicted home-range size, explaining 54 to 62 percent of observed variation (Tingley et al. 2014b). As snag basal area increased, home-ranges exponentially decreased in size, strongly suggesting increased habitat quality.

Suitable black-backed woodpecker habitat is defined specifically for this project and includes the following CWHR habitat types, size classes, and densities: Douglas-fir (DFR), Jeffrey pine (JPN), lodgepole pine (LPN), ponderosa pine (PPN), red fir (RFR), subalpine conifer (SCN), Sierran mixed conifer (SMC), and white fir (WFR); size classes greater than or equal to 3; pre-fire canopy closures M and D; and basal area mortality greater than or equal to 50%. Habitat criteria used in this analysis were determined from CWHR (CDFW 2008), scientific literature (e.g., Russell et al. 2007, Hanson and North 2008, Vierling et al. 2008, Bond et al. 2012, Siegel et al. 2013, Siegel et al. 2014, and USDA Forest Service Region 5 Regional Office guidance.

Burned forest habitat is most productive for black-backed woodpeckers during the first eight years following a fire. Burned habitat on private lands is assumed to be completely removed through

salvage logging. Treatments are limited on National Park Service Lands, typically consisting of minimal removal of hazardous trees along roadways. NFS lands are treated to varying degrees following a fire, typically harvesting only a small proportion of fire-killed trees in burned forest.

Suitable habitat exists outside the Rim Fire perimeter within California on NFS lands and is distributed throughout the Sierra Nevada and California. For example, in 2012, the Chips and Reading Fires on the Lassen and Plumas National Forests burned about 75,000 acres of NFS lands, of which about 67,000 acres of burned NFS lands remain untreated. In 2013, the American and Aspen Fires burned about 44,000 acres on NFS lands, of which about 32,000 acres of burned NFS lands will remain untreated. In 2014, the King Fire burned about 63,500 acres on NFS lands, of which about 10,000 acres will be salvaged or treated for fuels reduction. On the Stanislaus National Forest wildfires have occurred in the past several years and include:

1. The Knight Fire in 2009 burned about 6,000 acres, of which zero acres were salvaged,
2. The Ramsey Fire in 2012 burned about 1,000 acres, of which 250 acres was salvaged, and
3. The Power Fire in 2013 burned about 1,000 acres, of which zero acres were salvaged.
4. The Rim Fire in 2013 burned about 257,000 acres (155,000 on NFS Lands), of which 42,300 were either salvaged, treated for fuels reduction, or hazard tree removal.

As is evident with the acres burned versus the acres treated displayed above, most burned habitat remains on the landscape and provides habitat benefits to black-backed woodpeckers. When combined with suitable burned forest habitat on National Park Service such as Yosemite, even more habitat is available to black-backed woodpeckers. According to Miller and Safford (2012) and Westerling et al. (2006), large, high-severity wildfires have been increasing in frequency and duration over the past few decades and are predicted to continue into the future. Based on these reported trends and the large, high severity fires that have occurred in Region 5 over the past few years, it is reasonable to assume that the availability of burned forest habitat will continue increasing into the future.

The Rim Fire burned primarily on public land in two administrative units: Stanislaus National Forest and Yosemite National Park. Most of the suitable black-backed woodpecker habitat within the Rim Fire perimeter occurs on Yosemite National Park. Table 3.16-18 shows the amount of suitable habitat on public lands. Habitat that is currently being treated or scheduled for treatment in the near future (i.e., suitable habitat analyzed under Rim Recovery) is not included in table 3.16-18 or the direct and indirect effects analysis for this project. It is considered in the cumulative effects analysis for this project. Suitable habitat on private lands is assumed to have been removed through salvage operations.

Table 3.16-18 Amount of suitable black-backed woodpecker habitat in the Rim Fire area.

Ownership	Suitable Habitat (acres)	Proportion of Habitat (percent)
Stanislaus National Forest[1]	10,326	37%
Yosemite National Park	17,487	63%
Total	**27,813**	**100%**

Acres reported here represent existing suitable habitat acres considered for direct and indirect effects analysis only.

Black-backed woodpeckers are primary cavity excavators, creating holes in trees in which to lay their eggs and raise their young (Dixon and Saab 2000). The breeding season generally occurs from April through July and both sexes incubate, brood, and feed young (Bond et al. 2012). Nest cavities are usually excavated in snags but can be found in dead portions of live trees and in unburned forests. Nests are excavated in conifer trees and typically average 13-14”, which corresponds to CWHR size classes 4-5. Nest trees have occasionally been documented as small as 7”, which corresponds with CWHR size class 3 (Bond et al. 2012 and Seavy et al. 2012).

Black-backed woodpeckers readily forage on larvae of wood-boring beetles, engraver beetles, and mountain pine beetles found in the trunks of burned conifers (Dixon and Saab 2000). Hanson and North (2008) found preferential foraging on large snags >50 cm (20" dbh) in a study of 3 fire areas in the Sierra Nevada, which corresponds to CWHR size classes 4-6. Preliminary data from an ongoing study at two recent fire areas on Lassen National Forest suggests that black-backed woodpeckers forage on all available size classes of snags, but they forage on snags <10 cm less than was predicted (R. Siegel unpub. data).

Black-backed woodpeckers in western North America are not known to be migratory, although limited down-slope dispersal in winter has been reported (Dixon and Saab 2000). Reliance on recently burned areas of coniferous forest for breeding necessitates some post-breeding and post-natal dispersal to colonize new burns, but dynamics of dispersal in this species are not well studied (Ibid.). Occasional irruptions of 100's of km or more have been documented in eastern North America in response to food- resource and breeding dynamics; similar irruptions in western North America have not been recorded. In the Sierra Nevada, black-backed woodpeckers frequently colonize burned forest patches and breed in them less than one year after fire; no information is available indicating how far such individuals have dispersed (Dixon and Saab 2000, Siegel et al. 2008).

Risk Factors

Risks factors to black-backed woodpeckers have been summarized in "A Conservation Strategy for the black-backed woodpecker (*Picoides arcticus*) in California – Version 1.0":

1. *Salvage logging and other management involving post-fire snag removal*- Management activities commonly employed following wildfire include salvage logging and hazard tree removal have resulted in negative impacts such as reduced abundance and reproductive success in black-backed woodpeckers (Saab and Dudley 1998, Hutto and Gallo 2006, Saab et al. 2007, Koivula and Schmiegelow 2007, Hutto 2008, Cahall and Hayes 2009, Saab et al. 2009). Saab and Dudley (1998) and Hutto and Gallo (2006) found that nest densities were much higher in unlogged post-fire stands when compared with salvaged stands.
2. *Thinning of unburned forests*- Pre-fire forest thinning can decrease post-fire occupancy rates and nest densities of black-backed woodpeckers, and thinning or removal of medium and large snags may decrease habitat suitability in unburned forests. For example, black-backed woodpecker abundance in forests that were commercially thinned and then later burned in wildfire was lower than in burned forests that were not thinned before fire in the Rocky Mountains (Hutto 2008).
3. *Firewood cutting for personal use in recent fire areas*- Although systematic data on the effects of fuelwood cutting on nesting black-backed woodpeckers are not available, small scale harvesting of fuelwood by the public for personal use, from recent fire areas as well as unburned lodgepole pine forests, can destroy active black-backed woodpecker nests.
4. *Time since fire*- Probability of occupancy and nesting by black-backed woodpeckers in burned forest is negatively correlated with years since fire during the decade after the fire.
5. *Fire Suppression*- If fire suppression reduces the amount of mid- and high-severity post-fire habitat available for black-backed woodpecker, it may be considered a threat to the species.
6. *Climate change*- Although uncertain, climate change may affect the black-backed woodpecker through altered fire regimes and adjustments in distribution (e.g., occupying higher elevations and northern latitudes.

Management Direction

The Forest Plan does not contain management direction for black-backed woodpeckers (USDA 2010).

Management direction for black-backed woodpecker populations and habitat, snags in burned forest, can be found in the Rim Recovery EIS Terrestrial MIS Report. Management recommendations for black- backed woodpeckers can be found in the Conservation Strategy for the black-backed

woodpecker (*Picoides arcticus*) in California. Version 1.0. The Conservation Strategy for black-backed woodpecker includes the following recommendations:

Recommendation 1.1. Within the range of the black-backed woodpecker, ensure that post-fire management occurring in new fires that burn 50 or more ha of conifer forest at moderate- to high-severity consider snag retention and other burned-forest habitat needs of the species. Where feasible, black-backed woodpeckers will likely benefit most from large patches of burned forest being retained in unharvested condition.

Recommendation 1.4. Retain high tree density in the unburned forest periphery around fire areas, to provide foraging habitat in the later post-fire years (Saab et al. 2011).

Black-Backed Woodpecker: Environmental Consequences

This analysis is focused on the project effects related to management of burned forest, areas with documented basal area mortality greater than 50%. The project alternatives could result in direct and indirect effects to the black-backed woodpecker through the following activities:

- Removal of fire-killed trees.

These activities may have direct and indirect effects on black-backed woodpeckers through the following:

- Project related death, injury or disturbance.
- Project related modifications to habitat quantity or quality.

Death, injury, and disturbance

Death or injury from project related activities would be unlikely to occur given the mobility of this species. However, there is the potential for death or injury if a nest tree were felled while being used by black-backed woodpeckers. These potential direct effects are considered to be short-term and would only affect treated areas. Retained snags in treated areas would continue to provide cavity and foraging substrates. Untreated areas that burned at high severity and are suitable black-backed woodpecker habitat would be left intact, providing nesting and foraging habitat for black-backed woodpeckers.

Project activities, especially loud noise, could result in disturbance that may impair essential behavior patterns of the black-backed woodpeckers related to breeding or foraging. Loud noise from equipment such as chainsaws or tractors is expected to occur in reforestation units, on project roads, and at landings. The location of black-backed woodpeckers within the analysis area is uncertain but expected given the increase in available suitable habitat following the Rim Fire. Temporary avoidance of the project site or displacement of individuals is expected during project implementation.

Any displacement or avoidance related to noise disturbance would be of short duration and would subside shortly after project implementation activities. LOPs in place for spotted owls, goshawks, great gray owls, and bald eagles would afford protection to individual black-backed woodpeckers in these areas during the breeding season. The potential risk to individual black-backed woodpeckers is uncertain because the presence of suitable habitat is a recent development and limited surveys have been conducted. They have been documented in the project area in both 2014 and 2015 in low numbers.

The length of exposure to these disturbances is considered short-term and would occur in different areas any given year as implementation progresses across the landscape.

Habitat Modification

Removal of fire-killed trees in reforestation units would degrade suitable black-backed woodpecker habitat by removing burned snags this species requires for breeding and foraging. Home ranges are known to average about 89 hectares or 220 acres based on recent research (Tingley et al. 2014b). The basal area of burned snags is correlated with the home range size of black-backed woodpeckers (Ibid). Retaining large patches of burned snags, preferably greater than 220 acres and at elevations above 4,793 feet would provide high quality habitat for black-backed woodpeckers, potentially increasing the predicted bird density across the analysis area (Bond et al. 2012, Tingley et al. 2014b). Although treated areas are not expected to provide suitable habitat that would contribute to a black-backed woodpecker home range, snags retained within treated areas could provide foraging and possibly nesting structures. In addition, trees that survived the fire will remain on the landscape. Some of these trees will likely die, contributing to snag recruitment over the next several years and will provide additional habitat for black-backed woodpeckers.

In order to compare alternatives and potential effects to black-backed woodpeckers, we used a model developed by Tingley and others (2014a) that was designed specifically for the Rim Fire area. This model presents a method for predicting black-backed woodpecker pair density that combines model-based estimates of occupancy with expected bird density given occupancy (Ibid). Some of the covariates used in the model include pre-fire canopy cover, burn severity, CWHR size class > 3, and CWHR forest class. This model allows us to compare alternatives, accounting for the expected effects to black-backed woodpeckers. The model predicts the probability that a single cell (30 m X 30 m) is occupied by a black- backed woodpecker. The developer's intent for use of this model includes using density estimates to examine the relative effects of proposed alternatives to black-backed woodpeckers. Values are relative and should scale proportionally (Ibid).

Incorporating removal of habitat from the Rim Fire Hazard Tree Removal Project and Rim Recovery Project, there are a total of 21 predicted pairs of black-backed woodpeckers within the Rim Fire area on the Stanislaus National Forest. For analysis of direct and indirect effects associated with this project, 21 were used as the maximum predicted pair density possible.

Indicators

The following indicators were chosen to provide a relative measure of the direct and indirect effects to the black-backed woodpecker and to determine how consistent the project alternatives are with this species' conservation strategy recommendations.

1. Amount of suitable habitat modified.
2. Predicted pair density retained as a proportion of modeled pairs (Tingley et al. 2014a).
3. Toxicological effects from herbicide use.

These criteria were chosen to supplement the information provided in the MIS report by identifying and analyzing potential effects to the black-backed woodpecker related to expected densities within the project area. While the Rim Recovery MIS Report focuses on the relationship of project-level habitat impacts to bioregional scale and trend, the effects analysis here focuses on the relative value of different proposed management units by alternative within the Rim Fire area based on habitat quantity and quality (Tingley et al. 2014a). Acres in this analysis may vary slightly from those presented in the MIS report due to rounding error or to minor corrections made to continuously revised dynamic database sources.

Alternatives 1, 3, and 5

Because there is no difference in the areas proposed for treatment under these three alternatives, the effects are expected to be same and are analyzed together. The differences in herbicides proposed between Alternatives 1 and 5 versus Alternative 3 were separated below accordingly.

DIRECT AND INDIRECT EFFECTS

Indicator 1. Under Alternatives 1, 3 and 5, about 2,260 acres of suitable habitat would be modified, while about 8,066 acres of suitable habitat would be retained, Table 3.16-19. Snags would be retained at a rate of 12 to 30 square feet of basal area per acre, averaged on a unit basis. While snags retained at this density are not expected to provide suitable habitat that would contribute to a black-backed woodpecker home range, they would provide foraging and possibly nesting structures.

Indicator 2. Under Alternatives 1, 3, and 5 about 76 percent of modeled pairs (16) would be retained on STF lands, Table 3.16-19.

Of the action alternatives, Alternatives 1, 3 and 5 result in the least amount of habitat retention for black-backed woodpeckers and the lowest predicted pair density.

Indicator 3. Herbicide use under Alternatives 1 and 5 are expected to have limited potential for direct or indirect toxicological effects on black-backed woodpeckers, as described under the herbicide risk assessment section. Because no herbicides are proposed under Alternative 3, there would be no exposure to herbicides and no direct, indirect, or cumulative toxicological effects to black-backed woodpeckers under this alternative.

CUMULATIVE EFFECTS

The Forest queried its databases, including the Schedule of Proposed Actions (SOPA) to determine present and reasonably foreseeable future actions as well as present and reasonably foreseeable future actions on other public (non-Forest Service) and private lands (Appendix B, Rim Reforestation EIS). Some, but not all of these actions have or may contribute cumulatively to effects on black-backed woodpeckers.

Risk factors potentially affecting black-backed woodpecker abundance and distribution have been identified and include habitat removal through salvage logging and green thinning. Exposure to herbicides and potential toxicological effects associated with exposure were also identified as having the potential to affect black-backed woodpeckers. The following relevant evaluation criteria were used as relative measures of cumulative effects of Alternatives 1, 3, and 5 to black-backed woodpeckers: habitat modification. In addition, toxicological effects were used as evaluation criteria for Alternatives 1 and 5.

Habitat Modification

Federal Lands: Present and foreseeable future fuels reduction projects on federal lands include: Funky Stewardship, Groovy Stewardship, Reynolds Creek Stewardship, Soldier Creek Timber Sale, Campy Timber Sale, Looney Timber Sale, Thommy Timber Sale, which are green thinning projects treating 6,546 acres of green forest. All snags and many declining trees will be retained unless they pose a safety hazard in these projects. This snag and declining tree retention will provide snags in the short-term as well as recruit snags in the long-term.

The Rim Recovery Project (salvage and fuels reduction) is also a present action. About 11,000 acres of suitable black-backed woodpecker habitat are either currently being treated or will be treated in the near future. This habitat is modeled to support about 12 pairs of black-backed woodpeckers.

Toxicological effects

Federal lands: There is one present federal action of herbicide use on 0.5 acres under the Rim Fire Rehabilitation project and two foreseeable federal actions of herbicide use: 8 acres under the Twomile Ecological Restoration Noxious Weed project and 23 acres associated with a special use permit for the Reliable Power Project to control vegetation under powerlines. There are no other present or foreseeable future federal actions related to herbicide use.

Private lands: Herbicide use is proposed on 1,583 acres of private land within the project area in 2017. No other present or foreseeable future actions are proposed on private lands related to herbicide application.

Alternatives1, 3, and 5 Contribution/Summary: Alternatives 1, 3, and 5 are expected to contribute cumulatively to effects on black-backed woodpeckers. The cumulative contribution from this project under Alternatives 1, 3, and 5 would reduce the suitable habitat by an additional 2,260 acres and reduce the number of modeled black-backed woodpecker pairs by an additional 5 pairs. When combined with the Rim Recovery Project, a total of 13,260 acres of suitable habitat would be removed and a reduction of 17 modeled pairs of black-backed woodpeckers would occur (Table 3.16-20). The predicted pair density within the remaining suitable habitat on the Stanislaus and Yosemite National Park is 80 pair's (82%) of black- backed woodpeckers in the Rim Fire perimeter. Alternatives 1 and 5 would contribute to the short-term potential of exposure to toxicity from herbicide use. The cumulative contribution to effects on black-backed woodpeckers is considered minor and is not expected to affect the species viability.

Alternative 2

Under No Action, death, injury or disturbance would not be an issue because no active management would occur.

DIRECT AND INDIRECT EFFECTS

Indicators 1 and 2. The indirect effects of No Action are related to the amount of habitat retained and predicted pair density across the project area. Under this alternative, 10,326 acres of suitable habitat would be available to black-backed woodpeckers, Table 3.16-19. The predicted pair density associated with this alternative is 21, Table 3.16-19. This alternative provides the greatest amount of habitat and the highest predicted pair density when compared to Alternatives 1, 3, and 5. It provides the same amount of suitable habitat and predicted pair density as Alternative 4. Black-backed woodpeckers would be expected to occupy the available suitable habitat for the next 6-8 years, which is typically the period of time burned habitat is most suitable for this species.

Indicator 3. Because no herbicides are proposed under this alternative, there would be no exposure to herbicides and no direct, indirect, or cumulative toxicological effects to black-backed woodpeckers under this alternative.

CUMULATIVE EFFECTS

Under the No Action alternative, there would be no direct cumulative effect expected because no active management would occur.

Alternative 2 Contribution/Summary: The cumulative contribution under this alternative would result in the highest retention of suitable habitat available for black-backed woodpeckers when compared to Alternatives 1, 3, and 5, Table 3.16-20. Alternative 4 results in the same retention as the No Action alternative because no suitable black-backed woodpecker habitat is proposed for planting under Alternative 4. Retention of about 10,326 acres (30 percent) of suitable habitat on STF lands is expected from implementation of this alternative. The predicted pair density within the analysis area is 21 pairs of black-backed woodpeckers. About 27,813 acres of suitable black-backed woodpecker habitat would be retained across the analysis area on Stanislaus National Forest lands and Yosemite National Park. This habitat is predicted to support a total of 85 pairs of black-backed woodpeckers.

Alternative 4

DIRECT AND INDIRECT EFFECTS

Indicators 1 and 2. Because no treatments are proposed in suitable black-backed woodpecker habitat under this alternative, effects are expected to be the same as discussed under Alternative 2.

Indicator 3. Herbicide use under Alternative 4 is expected to have limited potential for direct or indirect toxicological effects on black-backed woodpeckers, as described under the herbicide risk assessment section.

CUMULATIVE EFFECTS

The cumulative effects discussion under Alternatives 1, 3, and 5 outline those present and foreseeable future activities scheduled on public and private lands.

***Alternative 4 Contribution/Summary*:** Cumulative effects related to habitat modification under this alternative are expected to be the same as discussed under Alternative 2. Alternative 4 would contribute to the short-term potential of exposure to toxicity from herbicide use. The cumulative contribution to effects on black-backed woodpeckers is considered minor and is not expected to affect the species viability.

Black-backed Woodpecker: Summary of Effects

Indicator 1. The amount of suitable habitat modified varies among the action alternatives, shown in Table 3.16-19. Alternatives 1, 3, and 5 would result in the greatest amount of suitable habitat modified when compared to Alternative 4. Alternative 4 would result in the least amount of suitable habitat modified.

Indicator 2. The predicted pair density varies between action Alternatives 1, 3, and 5 and Alternative 4, Table 3.16-19. Alternatives 1, 3, and 5 would result in the lowest predicted pair density when compared to Alternative 4. Alternative 4 would result in the highest predicted pair density among the action alternatives.

Table 3.16-19 Blacked-backed Woodpecker Summary of Direct and Indirect Effects

Indicator	Metric	Alternative				
		1	2	3	4	5
1. Amount of suitable habitat modified	Suitable habitat modified on STF lands[1]	2,260	0	2,260	0	2,260
	Percent suitable habitat modified[1]	22	0	22	0	22
2. Predicted pair density retained	Modeled pairs retained	16	21	16	21	16
	Percent of modeled pairs retained	76	100	76	100	76

[1] Based on acres of suitable habitat on Stanislaus National Forest.

Table 3.16-20 Blacked-backed Woodpecker Summary of Cumulative Effects

Indicator	Proposed and Present Projects	Alternative				
		1	2	3	4	5
1. Amount of suitable habitat modified	Suitable habitat modified on Stanislaus-Rim Fire Reforestation (acres)	2,260	0	2,260	0	2,260
	Suitable habitat modified on Stanislaus-Rim Recovery[1] (acres)	11,000	11,000	11,000	11,000	11,000
	Total suitable habitat modified within Rim Fire Perimeter (acres)	13,260	11,000	13,260	11,000	13,260
	Total suitable habitat modified within Rim Fire perimeter (percent)	35	29	35	29	35
2. Predicted pair density retained as a proportion of modeled pairs	Modeled pairs retained	80	85	80	85	80
	Percent modeled pairs retained	82	88	82	88	82

[1] Rim Recovery calculations represent the amount of acres that have not been treated as of March 2016.

Indicator 3. Herbicide use under Alternatives 1, 4, and 5 are expected to have limited potential for direct or indirect toxicological effects on black-backed woodpeckers. Because Alternative 4 has fewer acres of herbicide application proposed, the potential for effects would be less than under Alternatives 1 and 5. However, it is important to note that the toxicity exposure scenarios analyzed in the risk assessment show that all but three HQ values are at or less than the NOAEL threshold or No Observable Adverse Effect Level. There are three scenarios with HQs from 1.1 to 1.8 and involve ingestion of contaminated insects or fruit. These HQs are just above the threshold of concern, meaning there is a slightly elevated toxicological risk for individual black-backed woodpeckers ingesting contaminated insects or fruit. Given the foraging behavior of these species, it is unlikely that they would realize this actual level of exposure. Therefore, this species is provided an adequate margin of safety in the event that individuals are exposed to contaminated prey, fruit, or water.

Black-backed Woodpecker: Consistency with Conservation Strategy

There are no standards and guidelines or direction specific to black-backed woodpecker in the Stanislaus National Forest, Forest Plan Direction (USDA 2010). The Conservation Strategy for the Black-backed Woodpecker (*Picoides arcticus*) in California version 1.0 includes the following recommendations:

- Recommendation 1.1. Within the range of the Black-backed Woodpecker, ensure that post-fire management occurring in new fires that burn 50 or more ha of conifer forest at moderate- to high-severity consider snag retention and other burned-forest habitat needs of the species.
- Where feasible, Black-backed Woodpeckers will likely benefit most from large patches of burned forest being retained in unharvested condition.
- Recommendation 1.4. Retain high tree density in the unburned forest periphery around fire areas, to provide foraging habitat in the later post-fire years (see Saab et al. 2011).
- Recommendation 1.5. Avoid harvesting fire-killed forest stands during the nesting season (generally May 1 through July 31).

The action alternatives do not specifically incorporate a limited operating period for this species to prohibit salvage harvest during the black-backed woodpecker nesting season. However, the action alternatives do incorporate limited operating periods for Sensitive species within potential black-backed woodpecker habitat. Additionally, 78-100 percent of existing suitable habitat would be retained under all action alternatives. Alternative 4 considers full snag retention and no harvest within suitable black-backed woodpecker habitat.

It is important to note, the Conservation Strategy for Black-backed Woodpecker (*Picoides arcticus*) in California, Bond et al. (2012) is not a legally binding or regulatory document or agency policy; moreover it was not designed to constrain the FS in its actions and activities. It seeks to summarize known information about the species, recommends management approaches for conservation, and suggests future research priorities (Bond et al. 2012). By its very nature, the Black-backed Woodpecker Conservation Strategy only considers one species. The FS has to balance multiple priorities, objectives, uses, and species in its activities as a multiple use agency. And, at times, certain management objectives are in tension, if not direct conflict, with one another. For example, through this Project, the Forest seeks to plant conifers to reestablish green forest for species dependent upon it; yet, the Forest also wishes to conserve burned forest habitat for the black backed woodpecker and other species. The Forest has tried to strike a reasonable balance between these two goals at the landscape level, realizing it is not possible to fully achieve both of these goals on each and every acre.

Mule Deer: Affected Environment

Species and Habitat Account

The mule deer (*Odocoileus hemionus*) is an MIS species representing oak-associated hardwood and hardwood/conifer in the Sierra Nevada. The mule deer is also a species of conservation concern on the Stanislaus National Forest and is considered common to abundant with a wide distribution throughout the Sierra Nevada. They occur at elevations of 1,800’ to 11,800’ on the west slope of the Sierra Nevada.

Summer range typically occurs above 6,500’ elevation, transition range occurs between 4,500’ to 6,500’ elevation and winter range from 1,800’ to 4,500’ elevation. Mule deer are an important game species that is hunted throughout its range in California.

Trends in the migratory deer populations on the Stanislaus National Forest have been declining since the 1970’s (Maddox 1980). The Tuolumne and Yosemite herds have experienced downward population trends over the past several decades (Graveline pers. comm.).

Deer composition counts are conducted by CDFW in the spring and fall of each year in order to assess population trends. In 2009, Greg Gerstenberg, Senior Environmental Scientist with CDFW, initiated a study of the Tuolumne Mule Deer Herd to investigate exotic louse infestation, effects on individuals, potential spread, and the resulting influence on deer populations. VHF ear tag transmitters and G.P.S. collars are being used to monitor deer and gather data on over-winter survival, habitat relationships such as migration routes, summer range extent, and winter range habitat use (Gerstenberg 2012, unpub. report).

Collared deer were monitored shortly after the Rim Fire burned through the critical winter range for the Tuolumne Deer herd. Several collared individuals were lost, which indicates loss of many deer during the fire (Gerstenberg pers. comm.). Because the fire hit prior to the winter migration, most migratory deer were still on their summer ranges at higher elevations. There is a resident herd that remains in the lower country year round and these deer were much more susceptible to mortality from the Rim Fire. About 80 percent of collared deer (n=5) are thought to have perished in the fire (Graveline pers. comm.).

The Tuolumne and Yosemite deer herds have summer, transition, and winter range within the analysis area. The Jawbone Ridge area on the Stanislaus National Forest currently supports the highest concentration of wintering California mule deer from the Tuolumne Deer Herd and much of this area burned at high severity in the Rim Fire.

Mule deer utilize a variety of vegetation types including oak woodlands, coniferous forest, meadows and grasslands, chaparral and riparian corridors. Favorable habitat conditions for deer include vegetation communities that occur in a mosaic pattern with multiple age classes represented, and where cover and forage are in close proximity to free water (Ahlborn 2006).

Mule deer are polygynous, bucks mate with multiple does. Rutting begins in the fall and dominant bucks mate with multiple does as they come into estrous. Bucks fight and displace each other establishing and reestablishing dominance throughout the season. Gestation is about six to seven months, with fawns born typically May through July on the Stanislaus National Forest.

Mule deer browse or graze, showing preferences for forbs and grasses, as well as tender new shoots on various shrub species including mazanita, ceanothus, mountain mahogany, and bitterbrush (Kufeld 1973). Forage patterns vary with season, forage quality, and availability. Acorns are a critically important fall and winter food. Fawns from the Tuolumne Herd have an average weight that is 10 to15percent greater with a heavy black oak acorn crop (Gerstenberg, unpub. data).

Mule deer are either resident or migratory. Migratory deer travel downslope in the winter where conditions are milder and snow pack is minimal. The deer migrate upslope in the spring and early summer after the snow melts to birth fawns and gain access to high elevation meadows and grasslands that offer herbaceous forage high in nutrients.

Risk Factors

Risks to mule deer on the Stanislaus National Forest have been summarized by CDFW (Maddox 1980) and include:

1. *Range decadence*- Areas where shrub communities become decadent from the lack of fire or active management results in forage providing lower quality nutrients to deer, becoming inaccessible or unavailable and may impact individual fitness.
2. *Grazing* – On the summer range, cattle and deer compete for limited forage found in meadows and grasslands. Conflicts between cattle and deer on the winter range are not known to be a limiting factor for deer on the Stanislaus National Forest.
3. *Oak and shrub removal in type conversions* – Establishment of plantations in areas that would otherwise be dominated by shrub and oaks can reduce the amount of forage available to deer in a given area.
4. *Poaching*- Poaching occurs most often on the winter range and has affected not only the number of deer, but the age distribution of bucks. Poachers typically target older bucks presumably for the extensive antlers sought by many hunters; however, does are taken as well.
5. *Loss of Acorn Producing Oaks due to Catastrophic or Stand Replacing Wildfire* - Oaks take several decades to develop the capacity to produce acorns. Oaks that are lost to wildfire effectively reduce the amount of forage available and this is a critical food source in both transition and winter ranges.
6. *Loss of Meadow Habitat* - Meadows are an important component of deer habitat. Conifer encroachment threatens the viability and availability of meadows in the long-term.

Management Direction

Mule deer are an MIS species representing oak woodland and are also a species of conservation concern on the Stanislaus National Forest generally associated with early seral ecosystems (Damarais and Krausman 2000). Identifying areas within critical winter deer range for thinning green

plantations and reforestation will move us toward achieving the desired habitat conditions across the winter range as described in our purpose and need for the Rim Reforestation project.

The desired condition for reforestation units identified within critical winter range is to provide hiding and thermal cover in close proximity to high quality foraging areas where tree cover was lost in the Rim Fire. The desired condition for the existing plantations within critical winter range is to open up the canopy around oaks and create hiding and thermal cover areas where conifer densities are too high.

Mule Deer: Environmental Consequences

The project alternatives could result in direct and indirect effects to the mule deer through the following activities:

- Mechanical site prep for planting.
- Herbicide application for site prep and release of conifers.
- Planting conifers.
- Prescribed fire

These activities may have direct and indirect effects on mule deer through the following:

- Project related death, injury or disturbance.
- Project related modifications to habitat quantity or quality.

Death, injury, and disturbance

Death or injury from project related activities would be unlikely to occur given the mobility of this species. Project activities, especially loud noise, could result in disturbance that may impair essential behavior patterns of deer primarily on the winter range and transition or intermediate zones present within the analysis area. Loud noise from equipment such as chainsaws or tractors is expected to occur in reforestation and thinning units. Temporary avoidance of the project site or displacement of individuals is expected during project implementation. Any displacement or avoidance would be of short duration and would subside shortly after project implementation activities. The potential risk to individual deer is considered low because of their natural avoidance behavior.

Habitat Modification

Thinning green plantations would result in short and long-term benefits to mule deer. Short-term, thinning existing plantations would allow us to release surviving oaks and create effective hiding and thermal cover adjacent to foraging habitat. Thinning would also open up areas for herbaceous vegetation to reclaim the understory. Under these conditions, early seral vegetation, shrubs, grasses, and forbs are expected to be established within a few years post treatment. Creating a more open canopy forest would improve the ability of deer to evade predators. Additionally, thinning these areas would increase structural diversity and resiliency when fire moves through this area in the future.

Limited reforestation in deer winter range would also result in short and long-term benefits to deer. Short-term, reforestation of areas adjacent to high quality forage would increase accessibility to foraging habitat and provide protection from inclement weather throughout the winter range. Optimizing the location and size of hiding and thermal cover patches interspersed with foraging habitat would increase habitat effectiveness on the winter range (Thomas 1979). Long-term, foraging habitat interspersed with mature forest cover would provide high quality winter range and improve individual and herd health and survival. Using prescribed fire would also result in short and long-term benefits including; reducing dense thickets of shrubs that grow up next to oaks making them more vulnerable to mortality from wildfire, providing new more palatable forage in a variety of age classes, maintaining open conditions in the understory to provide for easy navigation of the landscape. While Salwasser and others (1982) have suggested that optimal habitat structure for deer in areas of cover

includes dense vegetation, the vegetation under four feet should be sufficiently open to allow for deer movement. More open conditions would also improve the ability for deer to more easily evade predators.

Indicators

The following indicators were chosen to provide a relative measure of the direct and indirect effects to mule deer.

1. Acres of hiding and thermal cover adjacent to high quality foraging areas and travel corridors, thinned and planted.
2. Toxicological effects from herbicide use.

These criteria were chosen based on the best available scientific literature which focuses on various aspects of deer ecology and life history requirements. These criteria focus on those life history aspects, or habitat elements, considered most limiting to deer persistence across their range and where project effects are expected.

Alternative 1, 3, 5

DIRECT AND INDIRECT EFFECTS

Because there is very little difference in the planting prescription and outcome in the short and long-term under these three alternatives, the effects of indicator 1 are expected to be similar under these three alternatives and are analyzed together.

Indicator 1.

Reforestation (includes natural regeneration): Under Alternatives 1, 3, and 5, about 646 acres are proposed for reforestation to provide forested cover in areas that burned at high severity in the Rim Fire in 2013. These areas, if reforested, would maximize habitat capability across the winter range. Benefits of these treatments include improving concealment cover and thermal relief along important movement corridors between foraging and bedding areas and increasing access to high quality foraging habitat. Reforestation would result in habitat improvement and increased access to forage across

The planting prescriptions under Alternatives 1 and 3 for hiding cover include planting alternating clusters of three and five trees and providing a 30 foot oak buffer for up to five oaks per acre. The desired condition is to create an open canopy structure that provides effective hiding cover, concealment from predators and humans. Planting prescriptions for thermal cover include planting individual trees ranging from 10 to 14 foot spacing while also providing buffers for up to five oaks per acre as described for hiding cover. All other oaks under both prescriptions would become part of the planting prescription, taking the place of a conifer seedling when planting.

The planting prescription under Alternative 5 is the same across all 646 acres; planting conifers with a 7 by 14 foot spacing. Up to five oaks per acre would be buffered as described under Alternatives 1 and 3. With the tighter spacing of planted trees, it would be necessary to thin the plantations around year 7 to create the open canopy desired for hiding cover and to provide longer term growing space to individual trees in areas designated for thermal cover. While the initial planting prescription calls for more trees, the outcome and long-term benefits described under Alternatives 1 and 3 above, would be realized under Alternative 5 with the incorporation of thinning these new plantations around year 7. Thinning would be by hand and material would be piled and burned on site. This is not expected to affect deer as this would be limited in scope and duration. Prescribed fire would be introduced to all new plantations as early as ten years after planting. Benefits of prescribed fire are discussed under habitat modification.

Thinning: Under these alternatives, 1,164 acres were identified for thinning within existing plantations. With the dense vegetation conditions that currently exist in these plantations, deer have limited movement corridors within the winter range and are more susceptible to predation (Gerstenberg pers. comm.). These conditions have resulted in much less deer use in these plantations today than several years ago (pers. obs.). These trees range from 8-12 inches dbh and are mature enough to provide the designated cover type immediately post treatment.

Deer are expected to benefit in the short and long-term from the thinning of existing plantations. The goal is to open up these stands, creating a habitat mosaic of more open conditions interspersed with dense pockets of trees that together would serve as hiding and thermal cover. Surviving oaks greater than or equal to six inches dbh would be targeted for release, removing any conifer within 30 feet of the bole of up to 5 oaks per acre. All other oaks would be included in the matrix of the stand where the remaining conifers would either be thinned to create hiding or thermal cover. Hiding cover areas would be thinned to create several small groups of trees (four to seven per group) with 30 foot spacing between groups. Thermal cover areas would be thinned to a spacing of about 20 to 25 feet to promote denser forested conditions.

Under these alternatives, thinning the plantations would result in more open stand conditions much easier for deer to navigate. Thinning would also increase light penetration and the availability of herbaceous forage throughout these stands. Proposed treatments would result in beneficial impacts on individual fitness through increased forage availability and quality, as well as the potential reduction in susceptibility to predation across the critical winter range.

The combination of thinning existing plantations and reforesting areas adjacent to high quality foraging habitat would improve habitat conditions across about 70 percent of the critical winter range. The collective suite of treatments including reforestation and thinning adjacent to high quality foraging habitats, and prescribed fire to manage vegetation densities and decadence, would result in high quality and sustainable habitat throughout the 7,000 acre critical winter range.

Indicator 2. Herbicide use under Alternatives 1 and 5 are expected to have limited potential for direct or indirect toxicological effects on mule deer, as described under the herbicide risk assessment section. Because no herbicides are proposed under Alternative 3, there would be no exposure to herbicides and no direct, indirect, or cumulative toxicological effects to mule deer under this alternative.

Noxious Weeds: Herbicides would be used to eradicate noxious weeds. The long-term benefits of noxious weed treatments near Jawbone Lava Flat include increased forage availability on critical winter range.

CUMULATIVE EFFECTS

The Forest queried its databases, including the Schedule of Proposed Actions (SOPA) to determine present and reasonably foreseeable future actions as well as present and reasonably foreseeable future actions on other public (non-Forest Service) and private lands (Appendix B, Rim Reforestation EIS). Some, but not all of these actions have or may contribute cumulatively to effects on mule deer.

Relevant risk factors potentially affecting mule deer abundance and distribution have been identified and primarily include range decadence, loss of acorn producing oaks, and loss of meadow habitat. Exposure to herbicides and potential toxicological effects associated with exposure were also identified as having the potential to affect deer. The following relevant evaluation criteria were used as relative measures of cumulative effects from Alternatives 1, 3, and 5: habitat modification. In addition, toxicological effects were used as evaluation criteria for Alternatives 1 and 5.

Habitat modification

Federal Lands: Present and foreseeable future activities on federal lands include: Funky Stewardship, Groovy Stewardship, Reynolds Creek Stewardship, Soldier Creek Timber Sale, Campy Timber Sale, Looney Timber Sale, Thommy Timber Sale, which are green thinning projects treating 6,546 acres of green forest across the analysis area. Releasing oaks is a part of all thinning prescriptions, which will protect an important food source for deer across the landscape, including transition zones. Fuels reduction associated with the Rim Recovery project will reduce the risk of further loss of remaining green forest within the project area. Other federal activities potentially impacting habitat for mule deer is meadow restoration.

Meadow restoration projects (Reynolds Creek, Rim Fire Rehabilitation, Twomile Meadow Restoration) are expected to improve foraging habitat across about 180 acres for mule deer. By removing encroaching conifers and improving hydrologic function of meadows on this landscape, habitat suitability in these meadows would increase forage availability for deer.

Toxicological effects

Federal lands: There is one present federal action of herbicide use on 0.5 acres under the Rim Fire Rehabilitation project and two foreseeable federal actions of herbicide use: 8 acres under the Twomile Ecological Restoration Noxious Weed project and 23 acres associated with a special use permit for the Reliable Power Project to control vegetation under powerlines. There are no other present or foreseeable future federal actions related to herbicide use.

Private lands: Herbicide use is proposed on 1,583 acres of private land within the project area in 2017. No other present or foreseeable future actions are proposed on private lands related to herbicide application.

Alternatives1, 3, and 5 Contribution/Summary: Alternatives 1, 3, and 5 would contribute cumulatively to short and long-term beneficial effects to mule deer by providing hiding and thermal cover in close proximity to high quality foraging habitat as well as releasing surviving and resprouting oaks, a critical food source for deer on their winter range. With a combination of thinning and reforestation where appropriate, habitat conditions would be improved throughout the 7,000 acres of designated critical winter range. Prescribed fire would play an important role in maintaining high quality habitat conditions across the winter range. These alternatives would result in benefits not realized under Alternative 4 where only 88 acres is proposed for reforestation, leaving high quality foraging habitat inaccessible. Alternatives 1 and 5 would contribute to the short-term potential of exposure to toxicity from herbicide use. Benefits for deer from the effective eradication of noxious weeds such as medusahead include increased herbaceous forage availability in critical wintering areas including Jawbone Lava Flat and far outweigh the limited exposure risk presented from the use of herbicides. The cumulative contribution under these alternatives may affect individual mule deer but is not expected to affect the viability of this species.

Alternative 2

DIRECT AND INDIRECT EFFECTS

Under No Action, death, injury or disturbance would not be an issue because no active management would occur.

Indicator 1. The indirect effects of no action are primarily related to the influence no action may have on the availability of cover adjacent to high quality foraging habitat and important travel corridors and not maintaining desired cover densities and palatable forage using prescribed fire. Under this alternative, it is likely that shrub cover would take the place of potential forested habitat. In the short-term, this would provide some cover and relief for deer from weather and predators. In the long-term, the shrubs would grow into dense thickets, prohibiting deer movement, increasing susceptibility to

predation, and increasing range decadence. No thinning of existing plantations would occur under this alternative. Surviving and resprouting oaks would not be released from competition and fuel loading would continue to increase adjacent to oaks resulting in increased vulnerability to mortality when the next wildfire moves through the winter range.

Indicator 2. Because no herbicides are proposed under this alternative, there would be no exposure to herbicides and no direct, indirect, or cumulative toxicological effects to mule deer under this alternative.

CUMULATIVE EFFECTS

The cumulative effects discussion under Alternative 1 outlines those present and foreseeable future activities scheduled on public and private lands.

Alternative 2 Contribution/Summary: Under Alternative 2, no direct cumulative effect is expected because no active management would occur, however, there may be indirect consequences under this alternative primarily related to the influence no action may have on the availability of cover adjacent to high quality foraging habitat and important travel corridors and not maintaining desired cover densities and palatable forage using prescribed fire. Oaks in untreated plantations would be at risk of loss when fire returns to this landscape. At the landscape scale, the cumulative contribution under this alternative would not increase habitat effectiveness for mule deer. The cumulative contribution under this alternative may negatively affect individual and potentially herd fitness, but would not likely affect the viability of the species across its range in the Sierra Nevada Bioregion.

Alternative 4

DIRECT AND INDIRECT EFFECTS

Indicator 1.

Thinning: Under Alternative 4, the thinning prescriptions and expected effects are the same as described under Alternatives 1, 3, and 5.

Reforestation: Under Alternative 4, only 88 acres are proposed for reforestation. This is 558 acres less planting than proposed under Alternatives 1, 3, and 5. The planting prescription under this alternative is termed founder stands. This prescription calls for small variable shaped planting areas ranging from two to ten acres in size within a larger unplanted area. The planted area is only 20 percent of a given unit. Plant 20 to 40 clusters per acre spaced an average of 33 feet apart. Within each cluster, plant five trees spaced six feet between each tree. Herbicides would be used to control shrubs and competing vegetation within planted areas and incorporating a 25 to 50 foot buffer around planted areas. With the tighter spacing of planted trees, it may be necessary to thin the plantations around year 7 to allow growing space for the trees to mature. Mechanical thinning is not proposed under this alternative; however, prescribed fire is proposed and would be used to thin the new plantations. Prescribed fire would be applied to 50 percent of planted areas within ten years and the other 50 percent within 20 years. Prescribed fire is expected to result in benefits similar to those discussed under the habitat modification section. Reforestation effects under this alternative include reduced access to high quality foraging habitat and reduced thermal cover and reduced habitat effectiveness. This alternative is less beneficial to deer when compared to Alternatives 1, 3, and 5.

Indicator 2. Herbicide use under Alternative 4 is expected to have limited potential for direct or indirect toxicological effects on mule deer, as described under the herbicide risk assessment.

Noxious Weeds: Herbicides would not be used to eradicate noxious weeds, but we would use other methods such as prescribed fire and targeted grazing to reduce weed populations where feasible. The long-term benefits of noxious weed treatments near Jawbone Lava Flat could be realized if prescribed fire and grazing are successful. Benefits include increased forage availability on critical winter range.

CUMULATIVE EFFECTS

The cumulative effects discussion under Alternative 1 outlines those present and foreseeable future activities scheduled on public and private lands.

Alternative 4 Contribution/Summary: Alternative 4 would contribute cumulatively to short and long-term effects to mule deer. This alternative would provide only 13 percent of the desired hiding and thermal cover in close proximity to high quality foraging habitat. This alternative would result in reduced habitat effectiveness across the winter range when compared to Alternatives 1, 3, and 5. With a combination of thinning and reforestation, habitat conditions would be improved on about 3,200 acres of designated critical winter range. Prescribed fire would play an important role in maintaining habitat conditions across the winter range, including reducing fuel loading and stimulating growth of new palatable forage. Alternative 4 would contribute to the short-term potential of exposure to toxicity from herbicide use. The cumulative contribution under these alternatives may affect individual mule deer but is not expected to affect the viability of this species.

Mule Deer: Summary of Effects

Indicator 1. Of the action alternatives, Alternatives 1, 3, and 5 would improve the greatest amount of habitat by thinning existing plantations, planting conifers in close proximity to high quality foraging habitat, and using prescribed fire to maintain high quality habitat conditions. Alternative 4 would improve the least amount of habitat and would incorporate the use of prescribed fire to maintain habitat conditions.

Table 3.16-21 Mule Deer Summary of Effects

Indicator	Metric	Alternative				
		1	2	3	4	5
1. Hiding and thermal cover adjacent to high quality foraging areas	Acres reforested[1]	646	0	646	88	646
	Acres of existing plantation thinned	1,164	0	1,164	1,164	1,164

1 Includes natural regeneration

Indicator 2. Herbicide use under Alternatives 1, 4, and 5 are expected to have limited potential for direct or indirect toxicological effects on mule deer. Because Alternative 4 has fewer acres of herbicide application proposed, the potential for effects would be less than under Alternatives 1 and 5. However, it is important to note that the toxicity exposure scenarios analyzed in the risk assessment show that all HQ values are less than the NOAEL threshold of concern or No Observable Adverse Effect Level. Therefore, this species is provided an adequate margin of safety in the event that individuals are exposed to contaminated vegetation or water.

Mule Deer: Compliance with Forest Plan

There are no specific Forest Plan Standards and Guidelines for mule deer applicable to this project.

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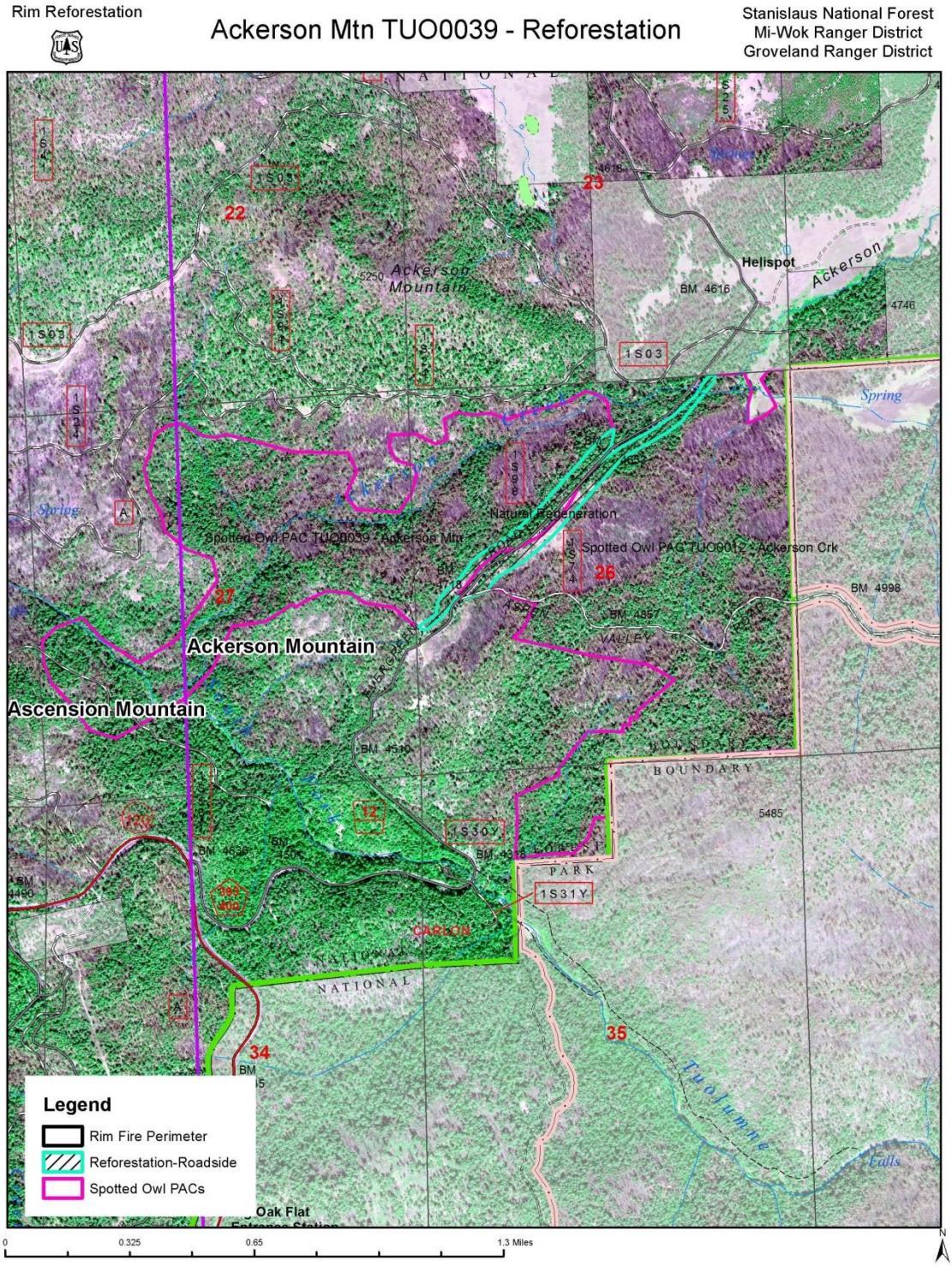
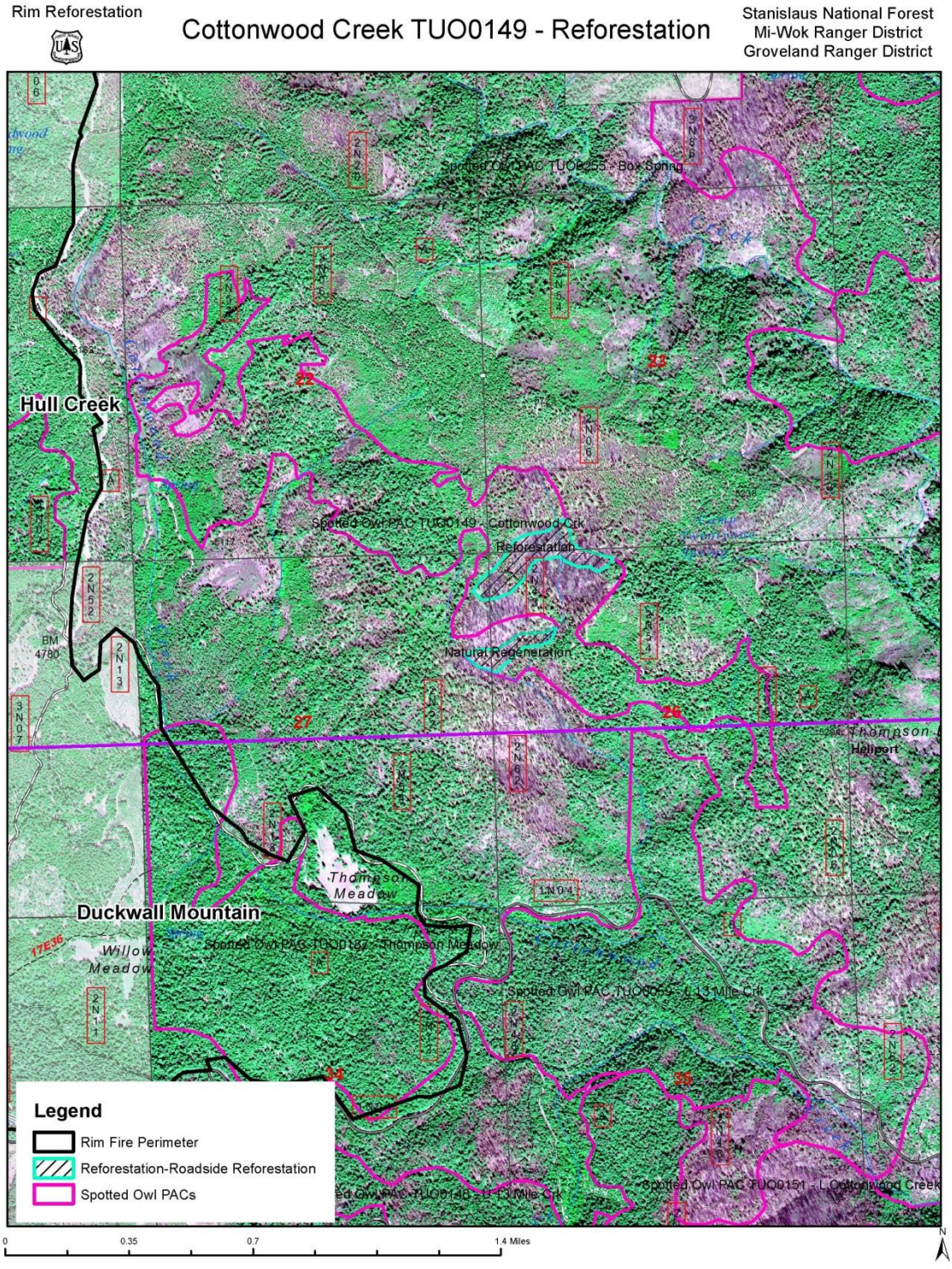
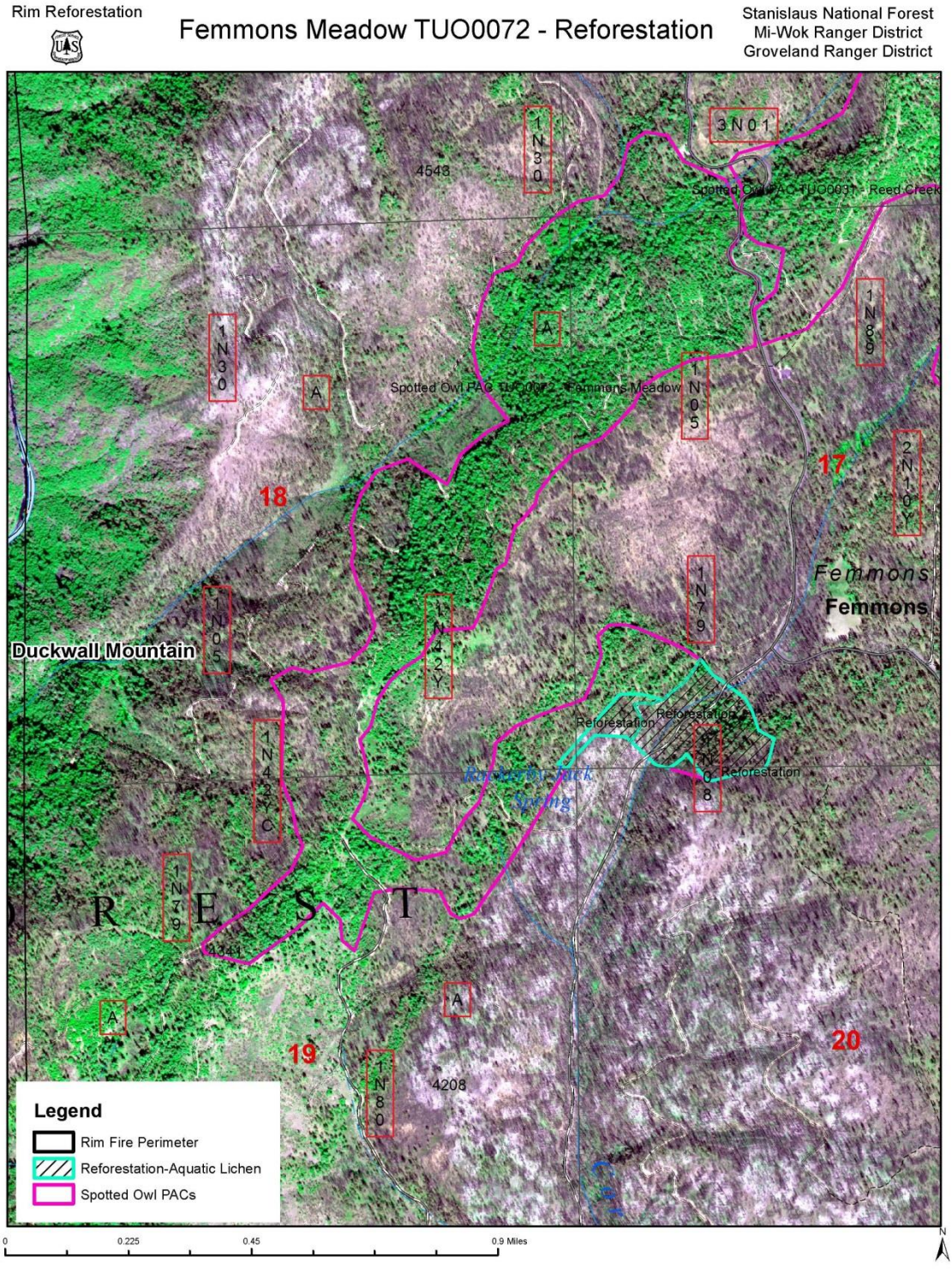
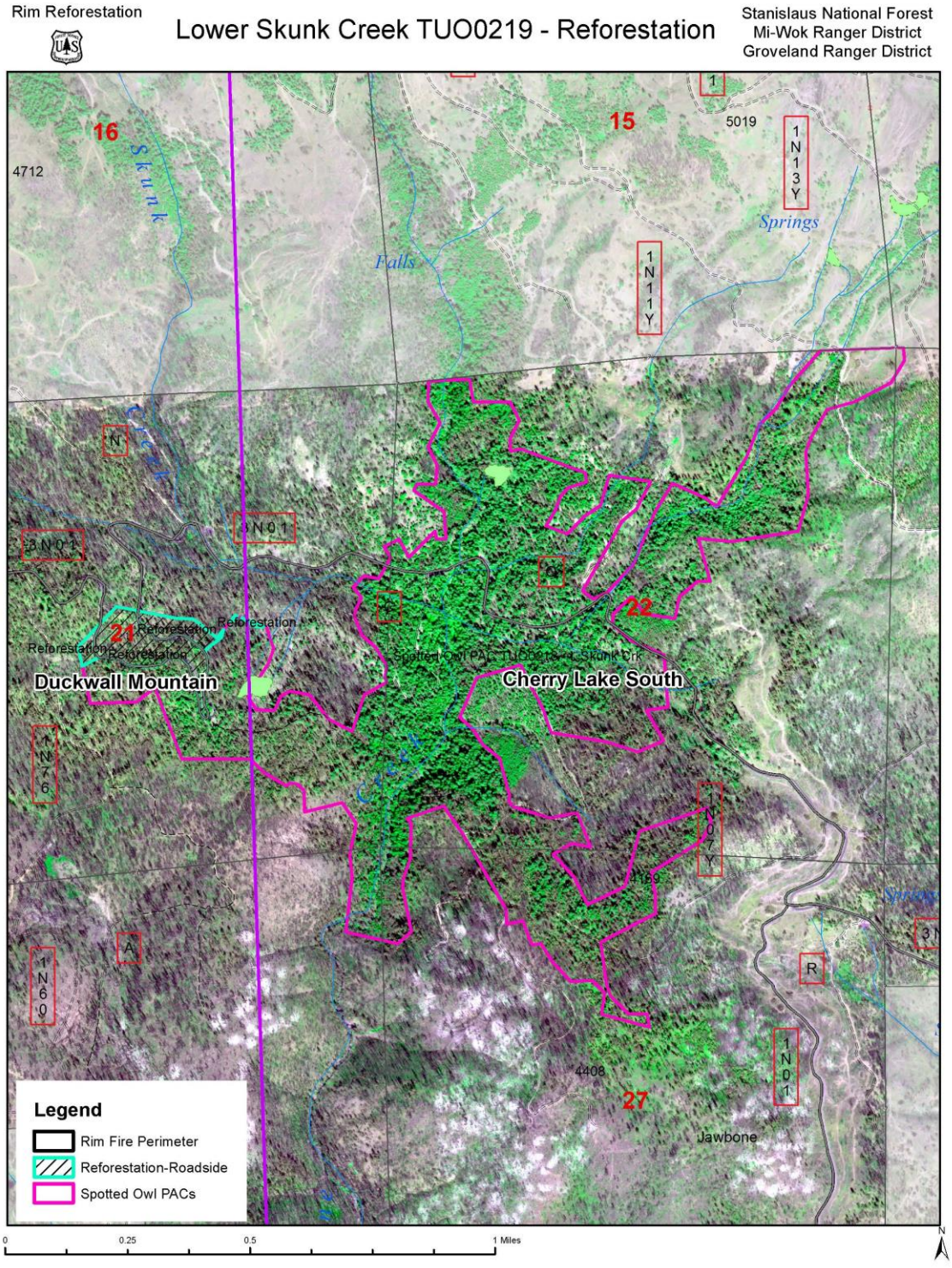
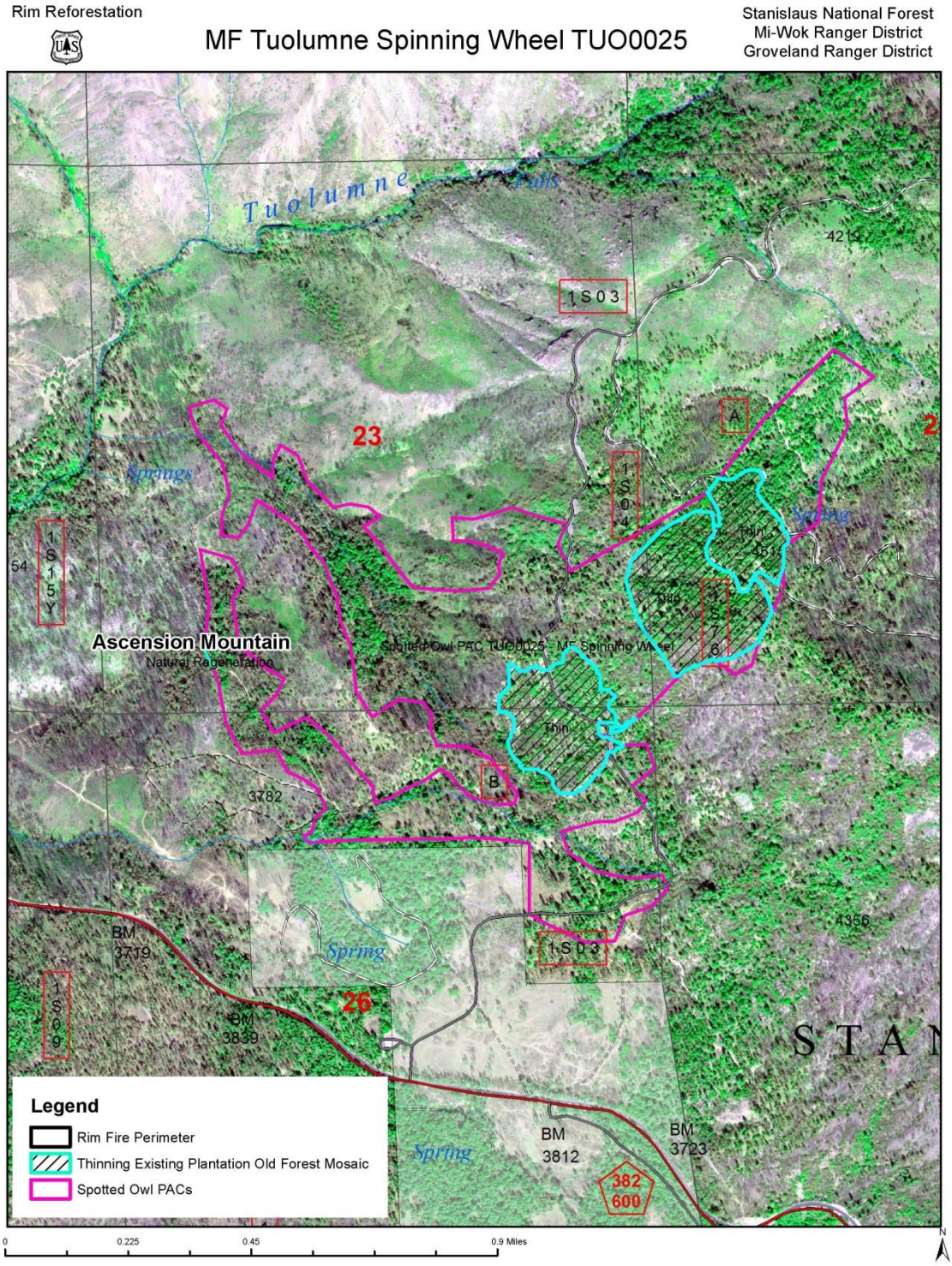
Appendix A. Spotted Owl PAC Treatments

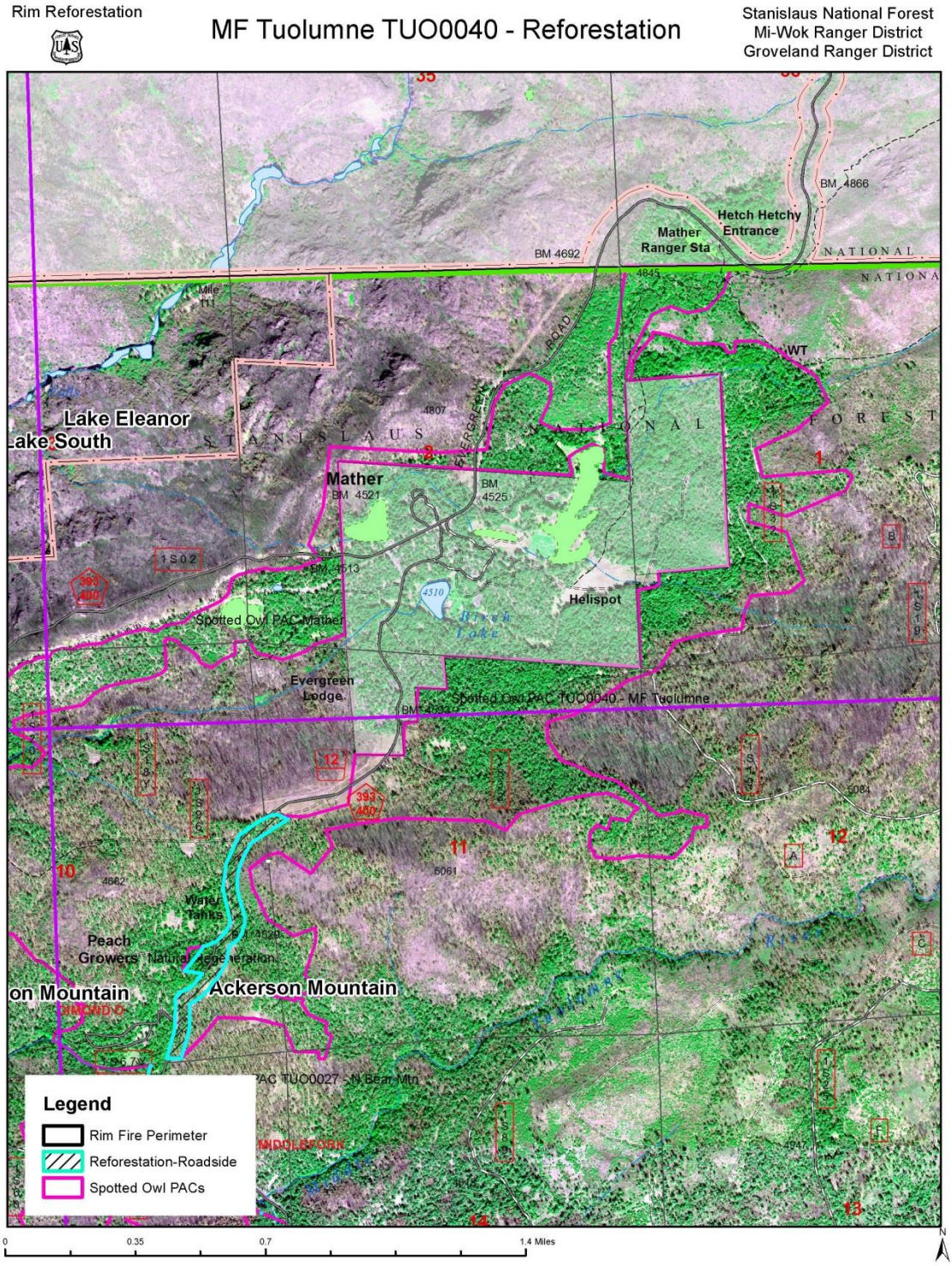


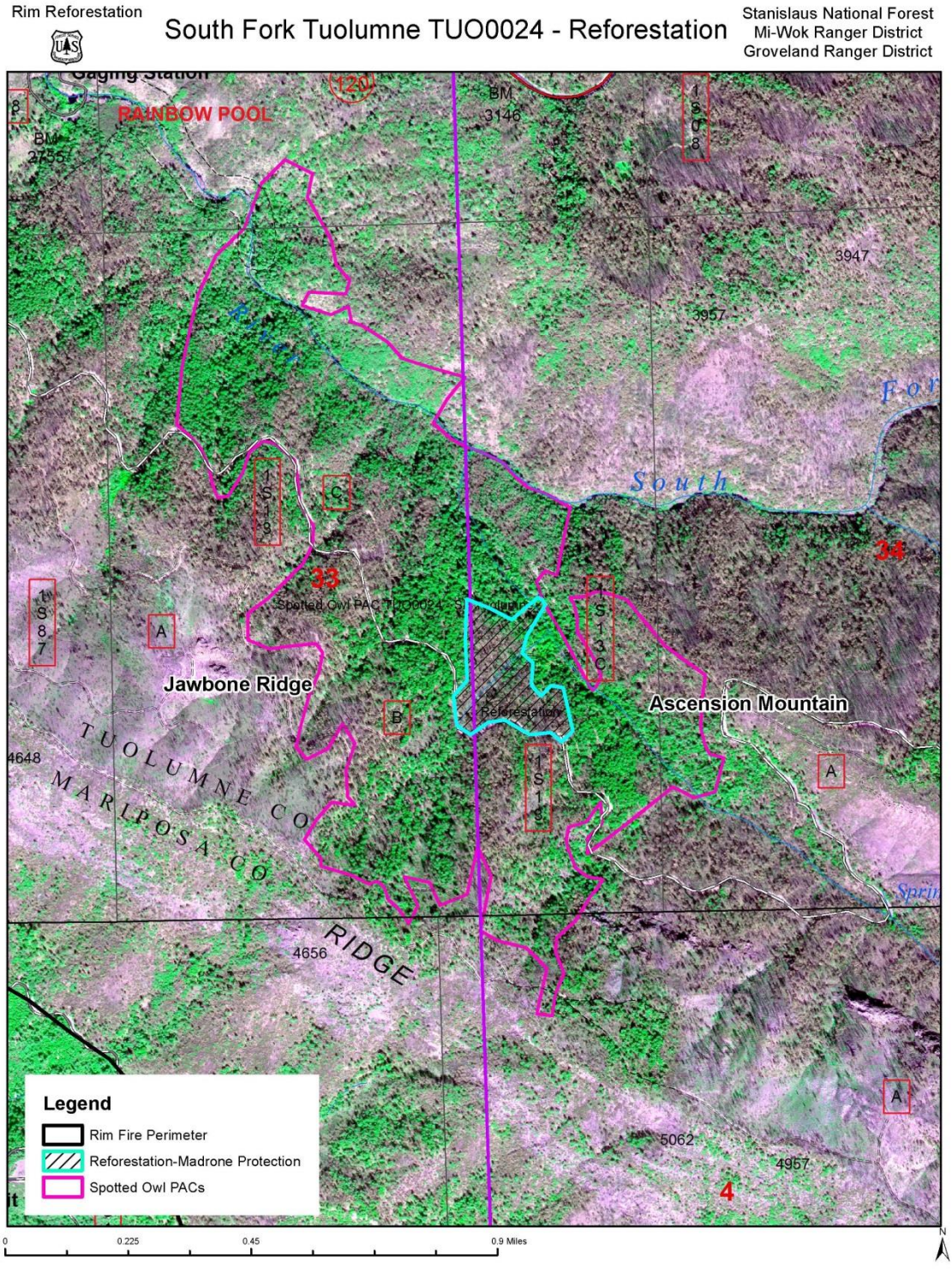

Rim Reforestation
Cottonwood Creek TUO0149 - Reforestation
Stanislaus National Forest
Mi-Wok Ranger District
Groveland Ranger District
Hull Creek
Duckwall Mountain
Spotted Owl PAC TUO0255 - Box Spring
Spotted Owl PAC TUO0149 - Cottonwood Crk
Reforestation
Natural Regeneration
Spotted Owl PAC TUO0182 - Thompson Meadow
Spotted Owl PAC TUO0059 - L 13 Mile Crk
Spotted Owl PAC TUO0151 - L Cottonwood Creek
Thompson Meadow
Willow Meadow
Heliport
BM 4780
Legend
Rim Fire Perimeter
Reforestation-Roadside Reforestation
Spotted Owl PACs
0
0.35
0.7
1.4 Miles
N

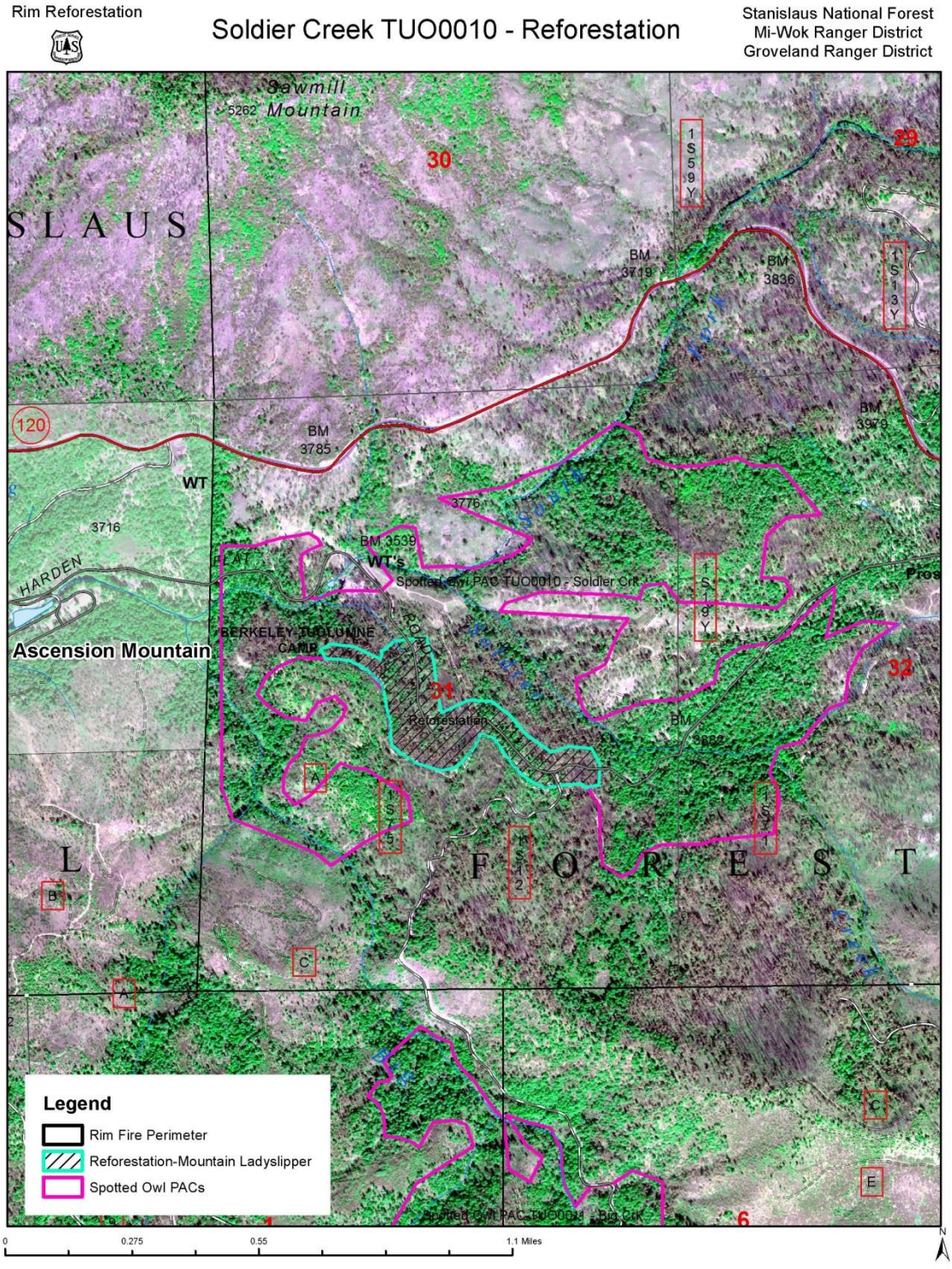

Rim Reforestation
Femmons Meadow TUO0072 - Reforestation
Stanislaus National Forest
Mi-Wok Ranger District
Groveland Ranger District
4548
1N30
3N01
Spotted Owl PAC TUO0031 - Reed Creek
1N30
A
A
Spotted Owl PAC TUO0072 - Femmons Meadow
1N05
1N89
17
2N10Y
18
Femmons
Femmons
1N79
Duckwall Mountain
1N05
1N42Y
Reforestation
Reforestation
1N08
Reforestation
1N42YC
Spring
1N79
R E S T
3344
A
A
19
20
1N80
4208
Legend
Rim Fire Perimeter
Reforestation-Aquatic Lichen
Spotted Owl PACs
0
0.225
0.45
0.9 Miles
N


Rim Reforestation
Lower Skunk Creek TUO0219 - Reforestation
Stanislaus National Forest
Mi-Wok Ranger District
Groveland Ranger District
16
15
22
21
27
4712
5019
Skunk
Falls
Springs
Duckwall Mountain
Cherry Lake South
Jawbone
4406
Reforestation
Legend
Rim Fire Perimeter
Reforestation-Roadside
Spotted Owl PACs
0
0.25
0.5
1 Miles
N


Rim Reforestation
MF Tuolumne Spinning Wheel TUO0025
Stanislaus National Forest
Mi-Wok Ranger District
Groveland Ranger District
Tuolumne
Falls
1S03
23
Springs
1S04
Thin
451
Spring
1S15Y
54
Ascension Mountain
Natural Regeneration
Spotted Owl PAC TUO0025 - MF Spinning Wheel
1S26
Thin
B
3782
BM
3719
Spring
1S03
4356
26
1S09
BM
3839
Legend
Rim Fire Perimeter
Thinning Existing Plantation Old Forest Mosaic
Spotted Owl PACs
Spring
BM
3812
BM
3723
382
600
0
0.225
0.45
0.9 Miles
N


Rim Reforestation
MF Tuolumne TUO0040 - Reforestation
Stanislaus National Forest
Mi-Wok Ranger District
Groveland Ranger District
Hetch Hetchy Entrance
Mather Ranger Sta
BM 4866
BM 4692
Lake Eleanor
Mather
BM 4521
BM 4525
Helispot
Spotted Owl PAC Mather
Spotted Owl PAC TUO0040 - MF Tuolumne
Evergreen Lodge
Peach Growers
Ackerson Mountain
Legend
Rim Fire Perimeter
Reforestation-Roadside
Spotted Owl PACs
0
0.35
0.7
1.4 Miles


Rim Reforestation
South Fork Tuolumne TUO0024 - Reforestation
Stanislaus National Forest
Mi-Wok Ranger District
Groveland Ranger District
RAINBOW POOL
BM 3146
BM 2755
3947
3957
South
33
34
Spotted Owl PAC TUO0024
Reforestation
Jawbone Ridge
Ascension Mountain
TUOLUMNE CO
MARIPOSA CO
4648
4656
RIDGE
5062
4957
Legend
Rim Fire Perimeter
Reforestation-Madrone Protection
Spotted Owl PACs
0
0.225
0.45
0.9 Miles
N


Rim Reforestation
Soldier Creek TUO0010 - Reforestation
Stanislaus National Forest
Mi-Wok Ranger District
Groveland Ranger District
Sawmill Mountain
5262
30
29
31
32
6
SLAUS
FOREST
BM 3719
BM 3836
BM 3785
BM 3979
3776
3716
BM 3539
WT
WT's
HARDEN FLAT
Ascension Mountain
BERKELEY TUOLUMNE CAMP
Reforestation
Spotted Owl PAC TUO0010 - Soldier Crk
Spotted Owl PAC TUO0011 - Big Crk
120
Legend
Rim Fire Perimeter
Reforestation-Mountain Ladyslipper
Spotted Owl PACs
0
0.275
0.55
1.1 Miles
N