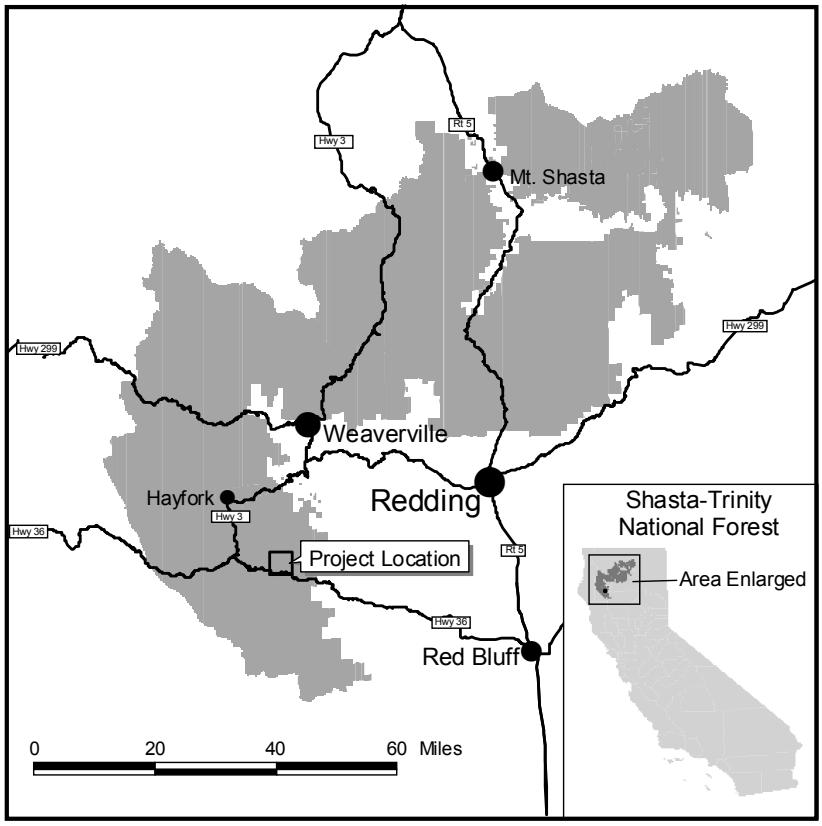
Appendix G: Biological Assessment - Wildlife



Prepared By: ___/S/ **Thomas A. Quinn**_____ Date: 12/20/07_Final to FWS
Thomas A. Quinn, Wildlife Biologist
Trinity River Management Unit
Shasta-Trinity National Forest
Contact person, phone (530) 623-1758

Reviewed By: _____ Date: _____
S. Kelly Wolcott, Forest Wildlife Biologist
Shasta-Trinity National Forest
Phone (530) 226-2433

Introduction

The purpose of this biological assessment (BA) is to present the likely effects of the actions proposed in Alternative 1 of the Gemmill Thin Project Environmental Impact Statement to federally listed threatened, endangered or proposed species. This document is prepared in accordance with current policy and follows the standards established in Forest Service Manual direction (FSM 2670.32).

Note that Alternative 3 is included in Tables 4a, 4b, and 5. Alternative 3 defers units 9, 11, and 12. However, the overall effects to owl habitat are very similar to those related to Alternative 1 and the same determinations would have been reached as with Alternative 1.

The Shasta-Trinity National Forest accessed the most recent list of endangered, threatened, or proposed species that may occur in the project area vicinity (i.e., Trinity County) from the USFWS web site dated November 20, 2007 (http://www.fws.gov/arcata/specieslist). This list included as Appendix 1 of this document. From this list, **the species considered in this document are**:

Endangered

- none

Threatened

- northern spotted owl (*Strix occidentalis caurina*)
- marbled murrelet (*Brachyramphus marmoratus*)
- California red-legged frog (*Rana aurora draytoni*)

Proposed

- none

If warranted for analysis, McDonald's rockcrest and eight fish found on this list will be considered in separate documents. The Pacific fisher and the western yellow-billed cuckoo are candidate species and do not have to be considered under this analysis. The Pacific Fisher is, however, analyzed as a sensitive species. The proposed project is outside of the known range of the western yellow-billed cuckoo and the marbled murrelet.

Consultation to Date

Consulting biologists with the U.S. Fish and Wildlife Service (USFWS, Red Bluff Field Office) have been involved with the Gemmill Thin project through numerous field visits, meetings and phone conversations since the early planning stages, including: Danielle Chi (2004), Heidi Crowell (2005), Keith Paul and Doug Powers (2006) and Keith Paul (2007). Field discussions have included review of proposed treatment areas and proposed actions in reference to spotted owl and fisher habitats within the analysis area.

Keith Paul was provided a draft of this document on November 23, 2007 for review and comment which he provided on November 30, 2007. Mr. Paul requested an expanded discussion specific to spotted owl Critical Habitat Unit 36. His request is addressed in this final document.

Current Management Direction

The Shasta-Trinity National Forest (STNF) is currently operating in full compliance with the *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (ROD; USDA Forest Service and USDI Bureau of Land Management, 1994). The Regional Forester approved the STNF Land and Resource Management Plan (Forest Plan or LRMP) on April 28, 1995 and it became effective as of June 5, 1995. The Northwest Forest Plan ROD was incorporated into the Forest Plan.

The Forest Plan adopts the ROD as the Federal contribution to the recovery of the northern spotted owl. The STNF expects the network of areas withdrawn from active timber management (e.g., wilderness, late-successional reserves, riparian reserves, and administratively withdrawn areas) along with standards and guidelines related to snag, log, and hardwood retention to provide habitat adequate to maintain viable well-distributed populations of federally listed or proposed species.

Description of Proposed Action(s)

Location of Proposed Actions

The project area is located on South Fork Management Unit in T.29 and 30 N., R.10 and 11 W., Mt. Diablo Meridian, northeast of the community of Wildwood, California and south of Chanchelulla Wilderness (see cover page and Map 1). The Forest Land and Resource Management Plan allocates this area to Late-successional Reserve (LSR), Riparian Reserves (wetlands and areas adjacent to streams) and a minor component of less than 5% to Matrix (commercial timber harvest emphasis). The 5% Matrix will be treated as if it were part of the LSR.

Purpose and Need for Action

Over the past 100 years the practice of excluding fire that periodically thinned out smaller less vigorous trees in the Chanchelulla Late-successional Reserve (LSR) has resulted in a forest ecosystem that is densely stocked and slow-growing (U.S. Department of Agriculture et al, Forest Wide LSR Assessment, 1997). Overcrowded conditions in mature stands (80 to 100 years old) are causing a delay in the establishment of healthy, functioning old-growth habitat. Overcrowded conditions in older mature/old-growth stands (100 – plus years old) do not promote long-term health and maintenance of key old-growth habitat components because the largest and oldest trees and their replacements are at risk to mortality due to the proximity and number of competing trees (Oliver & Larson 1990). In both cases, tree vigor is reduced because smaller trees are competing with larger trees for limited amounts of nutrients, sunlight, and especially water. This leaves the ecosystem more prone to disease and less resilient to fire (Agee 1993). Without treatment, overstocked stands will not stay healthy or meet the need for more old-growth habitat in the LSR. Most of the existing plantations scattered throughout the LSR have never been thinned so they, too, are overcrowded and are hindered in their development of future old-growth habitat characteristics (Graham 1994 #333; Graham, Harvey, et al. 1999 #1690; Graham, McCaffrey, et al. 2004 #2199).

There is a need to thin the overstocked mature conifer stands that are 80-100 years old. Fewer and healthier trees per acre would serve two interrelated purposes: (1) accelerate the development of old-growth habitat characteristics and (2) reduce the loss of existing and developing old-growth habitat in the event of drought, disease or insect outbreaks and especially wildfire.

There is a need to thin below in older mature/old-growth stands that are over 100 years old. The thinning would favor the oldest/largest trees and would serve three interrelated purposes:

1. decrease the risk of losing existing large, old-growth trees by:
   a. removing those nearby trees that are competing for the available nutrients,
2. decrease the risk of losing future replacement old-growth trees by
   b. opening the canopy,
   c. allowing a portion of the understory to respond and grow into mini-gaps formed in the thinning;
   d. and allow potential regeneration to initiate;
3. reduce the risk of losing both of these key features to wildfire, drought, disease or insects by
   e. reducing the risk and hazard of wildfire,
   f. decreasing the competitive stress on the remaining trees, which will
      - increase the ability of the remaining trees to resist the physiological stresses of draught, disease and insect attack.

There is a need to thin plantations to increase conifer growth rate and reduce density to levels where flames are not likely to reach the canopy of the adjacent older stands during a wildfire.

There is also a need to protect late-successional and old-growth habitat from the threat of fire that could start inside or outside the perimeter of the LSR. Overcrowded stands increase competitive stress between trees which increases tree mortality from insect and disease. The higher level of dead and dying trees found in overcrowded stands in turn increases fire risk from either natural or human caused wildfire. These dead and dying trees provide greater fuels to not only carry a fire hotter and faster, but increases the risk that a cooler and slower fire would burn into the canopy. The majority of the private land closest to the Gemmill Thin project was harvested in the late 1960s to 1970s and continuing private harvesting is likely. Two public roads and a transmission line are within or directly adjacent to the project area. These linear features and past harvesting of private lands are associated with higher risk for fire starts that could affect the project area.

Summary of Proposed Actions

To meet the purpose and need, the proposed action will include the following treatments:

- **Thinning From Below in Dense Mature Stands (80 to 100 years old) - 750 acres**

  This treatment targets overly dense mature conifer stands to accelerate the development of desired old-growth characteristics and to reduce fuel levels to reduce the risk of stand replacing fires, those fires that burn into the crowns of the trees and kill the large majority of the trees of the stand. These stands do not yet exhibit the desired level of old-growth characteristics, but have

the potential to attain them. The largest and healthiest trees would be retained. A sufficient number of trees would be removed to maintain or increase growth rates of the mature trees and remove fuel ladders. Trees marked for removal with this 'thinning from below' would start with the smallest least healthy conifers and progressively involve larger trees until the existing 70 to 90 percent canopy cover is reduced to approximately 60 percent to make more water, nutrients, sunlight and growing space available to the remaining trees (conifers as well as hardwoods). The remaining trees would experience accelerated growth and health. In addition, the smaller trees that would be removed currently act as fuel ladders because their crowns are closer to the ground and allow flames to climb into the canopy. This could lead to a large-scale loss of conifer forest habitat. Biological legacies such as large/old green trees and other old-growth structural components (large snags, logs, viable hardwoods, etc.) would be retained within each harvest unit to provide these important habitat components as the stand develops.

- **Thinning From Below in Dense Mature/Old-Growth Stands (over 100 years old) - 530 acres**

  This treatment targets overly dense mixed conifer stands that are either currently old-growth or have a stronger component of large/old trees to maintain and prolong the persistence of existing old-growth characteristics. Existing canopy ranges from 60% to 90%+ canopy cover. The largest and oldest (predominant or 'legacy') trees within each stand would be retained and competing understory trees would be removed within a zone about 1 ½ the width of the old tree's crowns. A sufficient number of smaller trees would be removed to reduce the number of trees per acre to a level that provides an improved competitive advantage for the larger, older trees and removes fuel ladders that may threaten the remaining trees and adjacent stands. The post treatment stands would average 60% or more canopy cover.

Note: Although we differentiate the two thinning treatments above, they are mixed within the mapped units. The two general thinning prescriptions described above will be blended within each unit depending upon site specific conditions. In all thinning units, large old trees will be prioritized for protection. Thinnings will target competing understory trees around the 'legacy' trees in all units and dense pockets of mature trees will be targeted for thinning from below within mature/old stands leaving the largest and best of the existing trees.

- **Thinning Plantations (~20 years old) - 45 acres**

  This treatment targets overcrowded plantations to decrease competition for sunlight, nutrients, and water. This would improve stand vigor, reduce stand mortality, reduce susceptibility to primary and secondary insect and disease effects, and accelerate the development of large overstory conifers (Oliver and Larson, 1996). The thinning and release treatments would be accomplished through mastication (grinding up excess trees) in three plantations. Small conifer density would be reduced from roughly 300-plus trees per acre down to an average of 150 trees per acre; a level that maintains stand growth rate and reduces ladder fuels. Stand vertical structural diversity would be maintained or improved into the future by retaining intermediate, codominant, and dominant crown class hardwoods.

- **Thinning to Maintain Existing Fuelbreaks (80 to 150 years old) - 260 acres**

  This treatment targets fuel breaks that were created about 20 years ago. The effectiveness of the fuebreaks would be maintained through thinning with a prescription that would remove smaller diameter trees, brush and snags and reduce the existing 50-70 percent overstory canopy closure down to about 40 percent. Viable hardwoods would be cut back to the one-or-two most vigorous stems and maintained in the areas to provide vertical structural diversity. In general, these are multi-aged, multi-storied mixed conifer stands which have been partially cut or sanitized (i.e., dead or dying trees removed) in the past. However, tree mortality is still occurring throughout these stands. Large snags and most large logs have already been removed for fuels and fire fighter safety concerns. Hardwood species, including canyon live-oak, California black oak, and Pacific madrone, are common but are generally understory components. The forest-floor shrub, forb and grass components of these stands are generally well-developed.

- **Dead Fuels Reduction in mixed conifer forest (100 to 150 years old) – 28 acres**

  This treatment targets two stands that have experienced a high level of tree mortality due to insect, disease and windthrow. The resulting high fuel level puts these and adjacent stands at a high risk of being lost to crown fire. All live trees and all snags/logs greater than 19 inches dbh would be retained. Dead-standing trees and dead ground fuels would be concentrated or piled and then burned to reduce woody fuels.

- **Yarding Systems**: Trees, and some activity fuels, from the harvest units would be removed with a combination of tractor/mechanical yarding, skyline/cable yarding and helicopter yarding.

- **Landings**: Up to an estimated 31 (0.25 to 0.5-acre) temporary landings measuring roughly 100x100 to 100x200 feet would be constructed and an additional 23 existing landings would be reused. Landings are critical for handling and storing the substantial amount of woody material that would be produced by the removal of large numbers of relatively small diameter trees and dead fuel within the adjacent units. No trees greater than 24 inches diameter at breast height (dbh) would be cut to minimize impacts to old-growth habitat. The landings would be decompacted following the thinnings and fuels treatments to facilitate water infiltration and natural revegetation. Map 3 displays likely landing locations based upon intensive field reviews, topography, stand conditions and experience with where landings may be needed.

- We chose having a higher number of small landings versus fewer large landings because this allows us to strategically place landings to avoid or minimize impacts to the largest/oldest trees or old-growth habitat and minimize the ground disturbing effects of dragging logs long distances.

- **Roads**: Approximately 18 miles of existing roads would be reconstructed (brushed, smoothed, graveled, etc.) and less than one mile of temporary roads would be constructed. Temporary roads would access temporary landings within proposed thinning units and would be about 12 feet wide; they would be ripped (i.e., ‘decompacted’) and closed after completion of harvest activities to facilitate water infiltration and natural revegetation.

- **Rock Pits**: An estimated one existing rock pit would be expanded to provide source material for road reconstruction activities.
- **Activity Fuels Treatments**: Fuels created as a result of the proposed silvicultural prescriptions would be treated with a combination of mastication (plantations), mechanical removal, chipping, handpiling/burning, tractor piling/burning, prescribed underburning, or burning areas of concentrated fuels.

Additional Design Criteria for further Protection of Forest Resources (Mitigation Measures)

The project development team developed numerous design criteria to reduce or avoid impacts to forest resources. Below are those that closely relate to wildlife issues:

- Limited Operating Periods (LOPs) would be implemented to avoid direct adverse impacts to the northern spotted owl. From February 1 through July 10, all noise- and smoke-generating activities will be prohibited **within ¼ mile** of suitable nesting/roosting habitat. In addition, all vegetation removal/cutting/burning will be prohibited through September 15 **within** suitable nesting/roosting habitat. These LOPs may be lifted if surveys using currently accepted protocols indicate specific areas are not occupied by breeding owls or with the mutual consent of the U.S. Fish and Wildlife Service and the U.S. Forest Service.
- Retain existing large (>19 inches diameter at breast height) snags and down logs within thinning units. Snags felled for safety reasons would be left on site as logs.
- Maintain an average of 5 tons of logs per acre with a preference to have 4 to 6 logs per acre at the largest available diameter.
- Retain all viable hardwoods (i.e., those that have a reasonable chance of surviving and thriving after stand treatments).
- Riparian Reserves of intermittent and ephemeral streams that display annual scour will have a minimum 150 foot Riparian Reserve based upon the average maximum height of 200-year-old trees for the site.
    - There is one inner gorge greater than 150 feet from the defined channel of intermittent or ephemeral streams in unit 13 that will require a Riparian Reserve greater than 150 feet in width.
- Riparian Reserves of fish bearing streams that display annual scour will have a 300 foot Riparian Reserve based upon twice the average maximum height of 200-year-old trees for the site. There are no inner gorges or flood plains in the project area greater than 300 feet from the defined channel of fish bearing streams.
- Thinning may occur in the Riparian Reserves up to the inner gorge, or to 50 feet from the defined channel if no inner gorge exists, for the purpose of enhancing Riparian Reserve timber stand health and treating hazardous fuels. Thinning and fuels treatment will not reduce crown cover to less than 60% within Riparian Reserves.

- Locate landings and temporary roads so that no trees 24 inches or greater will be removed.

Existing Environment

Land Allocations and Critical Habitat

Virtually all the actions proposed in the Gemmill Thin Project lie within Late-Successional Reserve RC331 (Map 2). That is to say, the project units were established logically and practically using the easily identified main ridgeline that defines the Trinity/Shasta County line on the east side of the project whereas the LSR was mapped at a scale that included the entire range of the northern spotted owl from Washington state through California. Consequently, LSR boundaries, as delineated in computerized geographic information system databases, often are not located precisely on identifiable land features (e.g., ridgelines, roads, rivers, etc.). Therefore, portions of units 7, 10, 12, 15, and 28 lie outside the western official LSR boundary. Nonetheless, although the treatment areas are part of the matrix and not part of the LSR, these areas will be treated with the same LSR-driven purpose & need and management direction.

Northern spotted owl Designated Critical Habitat Unit (CA-36) largely overlays LSR RC331. However, portions of units 10, 15, and 27 (roughly 24 total acres) lie outside the CHU boundary (Map 2). Again, with this project, these areas will be treated with the same LSR-driven purpose & need and management direction.

Both LSR RC331 and CHU CA-36 add protected habitat around the Chanchelulla Wilderness and fill a void in the southeastern part of Trinity County. CHUs and LSRs provide relatively large blocks of suitable habitat that are well distributed across the range of the owl to provide the functions considered important to maintaining stable, self-sustaining, and interconnected populations.

Species and Habitat Account

Marbled Murrelet

The project area lies well outside the known or expected range of the marbled murrelet (Ralph et al. 1995). This species spends most of the time in Pacific coastal waters and nests in old-growth trees within about 37 miles of the coast; the project area lies about 70 miles from the coast. Therefore, this species will not be further discussed except in the determinations section (VII).

California Red-legged Frog

California red-legged frogs are not likely to occur in or near the project area (see below). Red-legged frogs breed in a variety of aquatic habitats but typically breed in still or slow moving water. Individuals may be found in upland habitats during periods of wet weather (USDI 2002). Many of the proposed treatment areas lie adjacent to relatively fast-flowing streams (i.e., not breeding habitat) but outside this frog's known or expected current range. Given that the proposed actions lie well beyond a distance where there would be a reasonable expectation of effects to even potential red-legged frog breeding habitat and that the project would not occur during a wet time of year when frogs may venture into upland habitats, the California red-legged frog will not be further discussed except in the determinations section (VII).

Current and Historic Distribution (range)

The project area lies about five miles from the current range and just within the historic range of the California red-legged frog (USDI 2002). Roughly 62 acres of the eastern-most portion of the project area (the eastern half of fuelbreak units #7, 15, 28, and 31) lie within the frog's historic range. This roughly three-mile section of the 300-foot wide fuel break is centered on the ridgetop that establishes the Trinity/Shasta County line (Map 1); the project lies almost entirely in Trinity County. The frog's historic range includes Shasta but not Trinity County; thus the fuel break goes about 150 feet into the historic range. This section of the fuel break lies about a ¼-mile upslope from headwater ephemeral streams that feed Middle Fork Cottonwood Creek. These headwater streams drain steep slopes (i.e., they are fast flowing) and do not likely provide potential red-legged frog breeding habitat.

Recovery Units

Roughly 62 acres of the eastern-most portion of the project area lie within the *North Coast Range and Western Sacramento River Recovery Unit*. In the project area vicinity, the historic range defines the recovery unit boundary (see above). Recovery units are regions of the frog's distribution that the FWS determined to be distinct from one another based on ecological characteristics, status of the frog, threats to the continued existence of the frog, or recovery actions needed within the area. Again, the fuelbreak lies on the very top of the ridge well away from potential red-legged frog breeding habitat (i.e., aquatic, e.g. streams).

Core Areas

The nearest core area, *Cottonwood Creek*, lies about seven miles southeast of the project area. Core areas are watersheds, or portions thereof, within a recovery unit that the FWS determined to be essential to the frog's recovery.

Northern Spotted Owl

Spatial Scales Analyzed (from Largest to Smallest)

- The 16,868-acre **spotted owl action Area** is the primary area analyzed for this project. It was established by a 1.3 mile buffer around all areas proposed for treatment. This area was deemed appropriate for the following reason: Based on available radio-telemetry data (Thomas et al. 1990), the U.S. Fish and Wildlife Service (FWS) estimated the median annual home range size for the northern spotted owl in California. Because the actual configuration of a home range is rarely known, the estimated home range of a northern spotted owl pair in California is represented by a 1.3-mile circle (3,340 acres) centered upon an owl activity center (e.g., nest site). Suitable habitat within a home range would likely be utilized to some extent within any given year by territorial owls. Therefore, any effects to habitat, both positive and negative, due to the Gemmill Thin Project would likely affect any current or potential future owl activity centers (i.e., nesting owls) in the area. That is to say, habitat affected by the project would fall within the home ranges of any owls nesting in the owl Action Area.

- **Five** individual **owl home ranges** for owl activity centers located by surveys or included in our records are analyzed (Maps 2 and 3).
- **Five** individual **owl territories** for owl activity centers located by surveys or included in our records are analyzed (Maps 2 and 3). The FWS uses a 0.7-mile radius circle around an owl activity center to delineate the area most heavily used (territory or "core area") by owls during the nesting season. These areas assist the FWS during project level consultation related to possible impacts to individual owl pairs.
- The **project area** includes only the areas that would be directly impacted by the proposed actions (e.g., thinning units, fuel break units, plantations). Thus, Alternative 2 (no action) has no 'project area.'

Note that the Upper Hayfork Creek 5th Field Watershed was used only for analyzing the "*Provide for Retention of Old-Growth Fragments Where Little Remains*" S&G (see Attachment 1). Information specific to northern spotted owl Designated Critical Habitat Unit (CA-36) is included to assist the FWS in consultation and maintaining accurate records related to this CHU.

Species Account

The project area vicinity was surveyed in 2005 and 2006 by the crews working under a Joint Venture Agreement with the University of Washington, Student Conservation Partnership Agreement, and Cost Share/Reimbursable with Hubbs Sea World. These surveys were designed to quickly and efficiently find owl nest sites and were not conducted to protocol. That is to say, positive results (nest sites located) are obviously credible but there is a small chance that other, less responsive owls may have gone undetected. In 2007, Forest Service crews completed a 3-visit survey of the action area with three additional visits planned for 2008. The surveys revealed three credible spotted owl activity centers within the action area and our records include two additional 'historic' centers (Maps 2 and 3). Table G-1 presents the information on the activity centers' status compiled to date.

Table G-1. Status of the five spotted owl activity centers in the Gemmill Thin Action Area.

Activity Center ID	Status (most recent pair or territorial single status confirmation year)	2005-07 Survey Results and Comments
TR094	Pair (1994)	2005 male heard at night, possibly the male from TR351 drawn in by the surveyor's hooting; 2006 no responses; 2007 no response. Whether this continues as a viable activity center is doubtful.
TR098	Reproductive Pair (2007)	2005 reproduction confirmed (two young); 2006 reproduction confirmed (two young); 2007 reproduction confirmed (two young)
TR228	Reproductive Pair (2007)	2005 nesting confirmed (reproduction unknown); 2006 male heard; 2007 reproduction confirmed (two young)
TR320	Reproductive Pair (1992)	2005, 2006 and 2007 no responses. Whether this continues as a viable activity center is doubtful.
TR351	Reproductive Pair (2006)	2005 nesting confirmed (reproduction unknown); 2006 nesting confirmed (nest failed early); 2007 male heard at night

Spotted Owl Population Trend

Courtney et al. (2004, Table G-2) report the most current estimated rate of population change (PC) for the northern spotted owl where a stable population is indicated by PC = 1, a declining population by PC < 1, and an increasing population by PC > 1. PC ranged from 0.896 to 1.005 and was <1.0 on 12 of 13 range-wide study areas. However, in only four of these 12 were 95% confidence intervals for PC < 1. Evidence for owl population decline was weak on the three study areas closest to the Gemmill Thin Project Area (i.e., Klamath, NW California and Hoopa study areas).

The wealth of information on the demography of the northern spotted owl is unique. For no other threatened or endangered species in this area do we have such extensive information on population trends and the factors affecting them. The demographic studies reported here are among the most significant achievements in conservation biology. Yet, the information is still far from complete. While northern spotted owl populations appear to be in decline, it is not possible to determine whether this decline is greater than that predicted at the time of the NWFP (Courtney et al. 2004).

Table G-2. Estimated rate of population change (PC) for Northern Spotted Owls, with standard error and 95% confidence interval (as reported in Courtney et al. 2004, Table 8.5). Shaded areas in this table identify the study areas closest to the Gemmill Thin Project.

	PC[1]	Standard Error	95% Confidence Interval	
			Lower	Upper
California				
NW California	0.985	0.013	0.959	1.011
Hoopa	0.980	0.019	0.943	1.017
Simpson	0.970	0.012	0.947	0.993
Oregon				
Coast Ranges	0.968	0.018	0.932	1.004
H.J. Andrews	0.978	0.014	0.950	1.005
Warm Springs	0.908	0.022	0.866	0.951
Tyee	1.005	0.019	0.967	1.043
Klamath	0.997	0.034	0.930	1.063
S. Cascades	0.974	0.035	0.906	1.042
Washington				
Wenatchee	0.917	0.018	0.882	0.952
Cle Elum	0.938	0.019	0.910	0.976
Rainer	0.896	0.055	0.788	1.003
Olympic	0.956	0.032	0.839	1.018

[1] A stable population is indicated by PC = 1, a declining population by PC < 1, and an increasing population by PC > 1.

Spotted Owl Habitat Account

The northern spotted owl is strongly associated with conifer stands that include the following characteristics: a multi-layered, multi-species (**including hardwoods**) canopy dominated by large overstory trees; moderate to high canopy closure; a high incidence of trees with large cavities and other types of deformities; **numerous large snags**; an abundance of large dead wood on the ground (**logs**); and open space within and below the upper canopy for spotted owls to fly (Thomas et al. 1990, USDI Fish and Wildlife Service 1990a). Nest sites are usually located within stands of old-growth and late-successional (late seral) forest dominated by Douglas-fir containing structures such as cavities, broken tree tops, or mistletoe (*Arceuthobium* spp.) brooms (Forsman et al. 1984, Blakesley et al. 1992, LaHaye and Gutierrez 1999). In redwood forests along the coast range of California, spotted owls may be found in younger forest stands with structural characteristics of older forests (Thomas et al. 1990). In the vicinity of the Gemmill Thin Project these habitat characteristics are essentially restricted to old-growth, and to a lesser

extent other late seral (mature late-successional) conifer stands. Recent landscape-level analyses suggest that a mosaic of late-successional habitat interspersed with other vegetation types may benefit spotted owls more than large homogeneous expanses of older forests (Zable et al. 2003, Franklin et al. 2000, Meyer et al. 1998) presumably by providing more foraging opportunities. Foraging habitat is the most variable of all habitats used by territorial spotted owls (Thomas et al. 1990). Descriptions of foraging habitat have ranged from complex structure (Solis and Gutierrez 1990) to forests with lower canopy closure and smaller trees than nesting/roosting habitat (Gutierrez 1996).

- **Critical Habitat**: The attributes of owl habitat described above provide the primary constituent elements (PCEs) related to spotted owl nesting, roosting and foraging habitat (connectivity is discussed below). PCEs are those physical and biological features that are essential to the owl's conservation.

Attachment 1 of this document provides habitat definitions and the assumptions used to analyze late-successional and old-growth habitat. Table G-3 displays the crosswalk between the two main stand attributes used (size class and canopy closure) and habitat specific to the spotted owl. Figure G-1 displays a visual generalization of relative owl habitat quality related to "crown diameter" and "canopy closure" attributes in our Forest GIS database.

Crown Diameter (Size) Classes

- 0 = shrub, forb, grass, noncommercial conifer, hardwood, and nonvegetated (no old-growth potential; not federal forest land).
- 1 = 0-5 foot crown diameter, seedling sapling; stand establishment stage; includes most contemporary plantations (future old-growth potential; federal forest land).
- 2 = 6-12 foot crown diameter, poles; growth and maturation with little or no natural thinning; includes minor acreages of contemporary plantations (future old-growth potential; federal forest land).
- **3** = 13-24 foot crown diameter, small to medium timber; continued growth and maturation and beginning natural thinning (current mature forest).
- **4 or greater** = >24 foot crown diameter, large sawtimber; transition stage (current old-growth forest).

Canopy Closure Classes

- S = <20%
- P = 20-39%
- **N** = 40-69%
- **G** = ≥70%

Table G-3. Spotted owl nesting/roosting (NR), foraging (F) and connectivity habitat related to late-successional (late seral) and old-growth habitat analysis and crown diameter & canopy closure (see Attachment 1).

Nesting/Roosting (NR)	4G & 4N (high quality NR; old-growth), and 3G (moderate quality NR)
Foraging (F)	3N
Connectivity (dispersal habitat)	4P, 4S, 3P, 3S, 2G and 2N (plus the categories above – 4G, 4N, 3G, and 3N)
Capable (potential future NRF)	all remaining Federal Forest Land (capable of growing to NRF habitat conditions)

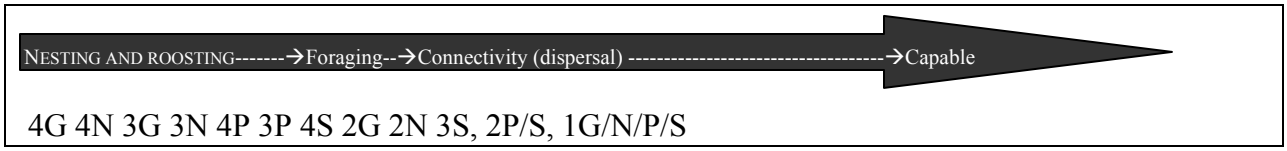


Figure G-1. The general relationship between late-successional (late seral) spotted owl habitat quality and size class & canopy closure to (from left to right, higher to lower quality)

Spotted Owl Nesting, Roosting and Foraging (NRF) Habitat

The current amount of NRF habitat within the spatial scales analyzed is included in Table G-4 and is displayed on Maps 2 and 3. Table G-5 also includes current habitat in CHU CA-36. In the spotted owl action area, old-growth (4N/G) provides 'high quality' owl nesting/roosting habitat ((1,688 acres) while younger densely (3G) to moderately canopied mature stands (3N) provide 'moderate quality' owl nesting/roosting habitat (3,908 acres) and foraging habitat (2,083 acres) respectively. There is a clear distinction between old-growth and late-successional habitat. Late-successional (late seral) is defined simply as conifer stands at least 80 years old regardless of other stand attributes such as level of decadence or canopy closure. Old-growth is a subset of late-successional and is defined as a forest stand usually at least 180-220 years old with moderate to high canopy closure; a multilayered, multispecies canopy dominated by large overstory trees; a high incidence of large trees, some with broken tops and other indications of old and decaying wood (decadence); numerous large snags; and heavy accumulations of wood, including large logs on the ground (NWFP ROD page F-4).

Connectivity (Dispersal) Habitat

Connectivity habitat is defined as conifer stands meeting at least '11-40' conditions (i.e., an average conifer of at least 11 inches diameter at breast height and at least 40 percent canopy closure) (Thomas et al. 1990). See Table G-3. Connectivity habitat comprises more than 81 percent (10,224 acres) of the 12,558 acres of Forest Service land in the spotted owl action area and is relatively contiguous. Thomas et al. (1990) established the level of adequate connectivity habitat at 50 percent of a given landscape (e.g., quarter-township). The 4,310 acres of private land in the area is comprised largely of connectivity habitat (albeit in many cases just barely). Owls may be reluctant to cross the relatively sparsely vegetated inner gorge of Hayfork Creek that runs north/south in the western quarter of the action area.

- **Critical Habitat**: The attributes of owl habitat described above provide the primary constituent elements (PCEs) related to spotted owl connectivity. PCEs are those physical and biological features that are essential to the owl's conservation.

The amount of NRF habitat within the spatial scales described above is included in Tables 4a & 4b (page 18) and displayed on Maps 2 and 3. Note that the amount of habitat in the project area is captured in the amount of habitat that would be affected (i.e., the proposed action).

Competitors & Predators

No known barred owl or great horned owls sightings occur in the action area.

Our field crew saw a goshawk attack the male of pair TR228 during a daytime visit near the activity center in mid June, 2007. Immediately after the attack the male flew away to the west and the goshawk flew away to the east. The male owl did not appear to have been injured.

West Nile Virus

West Nile virus occurs in the project area general vicinity (i.e., Trinity County) based upon positive lab test results of roughly 18 dead birds found throughout Trinity County (personal communication with Peter Hedtke; Trinity County Environmental Health Division of the Building and Development Services Department). None of the birds analyzed were spotted owls.

Effects of the Proposed Action

Actions Not Further Analyzed

The interrelated and interdependent actions listed below will not be further analyzed for the following reasons:

- **Road reconstruction and rock pit expansion** would occur within existing Forest Service system roadbeds or already heavily disturbed sites and would have no effect on existing owl habitat.
- **Temporary road construction** would occur only within proposed thinning units and their widths (about 12 feet) would be comparable to the leave tree spacing (i.e., comparable effects to canopy closure). Additionally, they would be ripped or subsoiled after use (i.e., the soil would be "decompacted") to allow water infiltration and revegetation. That is to say, the recovery of the stands as related to owl habitat would be similar with or without the temporary road construction. Therefore, the effects are lumped in with the effects of thinning.
- **Dozer and handlines** would occur within proposed harvest units and would have little effect on retained vegetation or habitat components. Therefore, the effects are lumped in with thinning/regeneration effects.
- **Activity fuels treatments** (including burning), **decompacting of temporary roads or landings**, and **road decommissioning** would not affect owl habitat.

- For all these actions the LOP avoids direct impacts to owl reproduction due to noise or smoke related to the proposed actions.

DIRECT EFFECTS (Mortality, Harm, Failed Breeding Attempts, Displacement)

We do not expect to harm or displace owls or cause owls to abandon an active nest site. The limited operating periods (LOP) included in the design criteria for this project minimize direct effects to the spotted owl by avoiding disturbances during critical periods of the breeding season or when young owls are not mobile enough to readily move from a disturbance. Due to our surveys in the project area, we know the vicinity of active nest sites and no actions are proposed within nest groves. Large areas of higher quality nesting habitat will remain after treatment.

The recent final report for the Effects of Noise Disturbance on Northern Spotted Owl Reproductive Success (Damiani, Lee, and Jacobson; September 28, 2007) is pertinent to the Gemmill Project because it is based upon data collected in a long-term study area that includes portions of the Shasta-Trinity National Forest in vegetation types similar to those in this project (personal observation) and addresses issues associated with this project. This study indicates that noise disturbance (no LOPs) from management actions does not appear to have significant short term effects on owl reproduction. Only when disturbance is ongoing and long-term (greater than 3 years) was a significant negative effect on numbers of fledglings produced evident. This report indicates that the long-term effects to owl reproduction are more likely associated with long-term loss of habitat rather than the noise disturbance. The Gemmill Thin project is designed to maintain and improve owl habitat and would maintain existing nesting/roosting habitat conditions in all areas but the proposed landings that would involve at most 12 acres. Damiani et al. studied the effects of 'timber sales' where large areas (of presumably owl habitat) were removed.

INDIRECT EFFECTS (i.e., Habitat)

Effects to Spotted Owl Nesting/Roosting (NR) and Foraging (F) Habitat

The Gemmill Thin Project Alternative 1 would reduce owl habitat quantity/quality in the short-term (≤10-15 years), increase owl habitat quantity/quality in the long-term (>10-15 years), and reduce the threat of losing existing and developing habitat in the short **and** long-term (see below). The project would affect approximately 1,210 acres of existing NRF habitat. Effects to existing NRF habitat are analyzed at the spatial scales described above (the owl action area, five owl home ranges, five owl territories, and the project area (or the actual areas that would be affected) and three categories of intensity (described below). The Upper Hayfork Creek 5th Field Watershed was used specific to the 15% S&G and is not used in this analysis (see Attachment 1). Tables 4a&b present the amount (acres) of each habitat type that would be affected segregated by the intensity and spatial scales. Map 2 displays the proposed actions related to NRF habitat at the action area and owl territory and home range scales.

Connectivity

The Gemmill Thin Project would remove up to a maximum of about 15 acres of connectivity habitat due to landing construction but connectivity habitat would remain at well above 50 percent threshold (Thomas

et al. 1990) in the action area (still over 81%). The size (up to 100 feet wide) and location of the proposed landings would not isolate existing NRF habitat and multiple connectors through the action area would remain (see Maps 2 and 3). That is to say, owls or other species crossing these areas would never be more than 50 feet from forest cover. Additionally, the proposed plantation thinning would accelerate the development of about 43 acres of connectivity habitat conditions in approximately 10 years. Without thinning, these plantations would likely reach 11-40 conditions but would remain so dense that owls would not be able to freely fly through them for 35+ years.

Short-Term (from implementation out to about 10-15 years)

The Gemmill Thin Project would affect owl habitat in the short-term in three general ways associated with primary constituent elements and at three intensity levels. Tables 4a & 4b display the effects to owl habitat at the spatial scales described above:

Effects to Habitat

- **Reduction in overall canopy closure**: A moderate to dense canopy closure is important to owls because it moderates environmental extremes (e.g., temperature, rain/snow fall, etc.).

  A reduction of canopy closure in order to meet the P&N is unavoidable. The no action alternative leads to a greater risk of stand-replacing fire and loss of habitat (see below). Our treatments would result in maintaining a moderate/dense canopy that will equal or exceed the canopy closure in untreated stands within about 10 to 15 years with the bonus that the treated stands would be much more resistant to stand-replacing fire.
- **Simplification in vertical structure**: Multiple canopy levels provided by understory conifers and hardwoods provide lower (cooler) roost sites in the hot summer months and provide perch sites for foraging and eating.

  We address this key component with the maintenance of existing viable understory hardwoods as well as the largest/oldest (predominant) conifers that are typically head and shoulders above the main overstory. The understory hardwood component will have a higher probability of persisting and thriving into the future with our treatments as would the predominant conifers.
- **Reduction in smaller diameter (<24" dbh) snags and logs**: Snags can provide owl nest sites and both snags and logs provide habitat for owl prey species. Large (>19"dbh) snags would be retained in the proposed thinning units and virtually no large snags occur in the fuel break area. My experience suggests that spotted owls would not likely use snags less than 24"dbh for nest sites.

Effects Intensity

- **Removed** indicates the habitat would no longer function as owl habitat resulting from **landing construction**. Landings are considered to be removing late-successional (i.e. owl) habitat even though this level of impact may be an overstatement. The scientists who contributed to the Northwest Forest Plan recognized that small (less than 10 acres) forest openings and canopy gaps are an important component of old-growth forest (NWFP ROD pages B-2 and C-14). This

is important because the Alternatives 1 and 3 require the construction of up to an estimated 31 small landings. Their construction would create small (¼ to ½ acre) openings measuring from roughly 100x100 to 100x200 feet. These landings are critical for handling and storing the substantial amount of woody material that would be produced by the removal of large numbers of relatively small diameter trees and dead fuel within the adjacent thinning units. These landings would be decompacted following the thinnings to facilitate water infiltration and natural revegetation. These openings are not expected to alter the habitat function of the overall stands because they would naturally revegetate relatively quickly, are well below the 10-acre opening threshold for an old-growth component established in the NWFP ROD, and would not involve 'old-growth' patches because they would be strategically located to involve only younger/smaller patches within the larger matrix of older habitat (i.e., no trees greater than 24 inches dbh). Additionally, if the entire project area were to be remapped after implementation, these small areas would fall well below the roughly 10-acre threshold for habitat mapping. That is to say, if old-growth habitat were mapped at a more precise ½-acre threshold, landing locations currently mapped as falling within old-growth would fall within mature forest. These small openings would not likely inhibit the free movement of owls or other species associated with late-successional forests; individuals crossing these areas would at no time be greater than roughly 50 feet from forest cover.

  - up to a maximum of 2.5 acres of high quality NR habitat (range from 1.25 to 2.5 acres)
  - up to a maximum of 9 acres of moderate quality NR habitat (range from 4.5 to 9 acres)
  - up to a maximum of 2.5 acres of Foraging habitat (range from 1.25 to 2.5 acres)

- **Downgraded** indicates a reduction in habitat capability such as owl nesting/roosting habitat down to foraging or foraging habitat down to connectivity habitat. None of the proposed treatments would result in owl habitat being downgraded.
- **Degraded** indicates some habitat components (e.g., smaller snags, canopy closure, and vertical structural complexity) may be somewhat reduced but the habitat would continue to function at the current level resulting from **thinning from below in existing mature/old-growth**, **ground fuels reduction** (i.e., dead woody material including smaller logs) within nesting/roosting/ foraging habitat and **fuel break** treatments within foraging habitat. Within thinning units, the retention of large predominant (legacy) conifers, larger snags (>19") and viable hardwoods would maintain snags and decadent conifers large enough to provide owl nest sites and contribute to vertical structure. This is a somewhat subjective effects category in that the habitat components that would be reduced are in excess of what would likely occur if fire had not been effectively excluded from these areas over roughly the last century. For example, thinning from below in existing mature/old-growth undeniably reduces potential understory roosting sites. However, numerous roost sites would remain but at levels that reduce the risk of losing suitable habitat conditions to wildfire and increase the persistence of the largest/oldest trees that provide the best nesting sites. Additionally, the areas proposed for treatment often have a thick sapling

cover (i.e., impenetrable to owls) and would become more available for foraging owls after treatment.

- 254 acres of high quality NR habitat
- 656 acres of moderate quality NR habitat
- 299 acres of Foraging habitat

Tables G-4a and G-4b. Direct effects (acres) to spotted owl nesting/roosting (NR) and foraging (F) habitat within 0.7 miles (i.e., 4a, the territories) and 1.3 miles (i.e., 4b, the home ranges) of the five owl activity centers that would be affected by Alternatives 1 and 3 of the Gemmill Thin Project. Acres included in *(parentheses) are for Alternative 3. Effects to the entire spotted owl action area are included at the bottom of Table G-4a. Old-growth is displayed separately from overall nesting/roosting habitat to emphasize its ecological significance.

Table G-4a Owl Territories		**High Quality NR (old-growth)**		**Moderate Quality NR (dense mature)**		**Foraging (mod. dense mature)**		**Total NRF**	
Activity Center ID	**Effects to Habitat**	**Existing Available Habitat**	**Acres Affected**	**Existing Available Habitat**	**Acres Affected**	**Existing Available Habitat**	**Acres Affected**	**Existing Available Habitat**	**Acres Affected**
TR094	Removed	63	0	428	0	144	0	**635**	**0**
	Degraded		0		0		16		**16**
	Total		**0**		**0**		**16**		**16**
TR098	Removed	348	3	382	4	74	2	**804**	**9**
	Degraded		140		230		49		**419**
	Total		**143**		**234**		**51**		**428**
TR228	Removed	142	0	211	0	118	0	**471**	**0**
	Degraded		0		0		0		**0**
	Total		**0**		**0**		**0**		**0**
TR320	Removed	183	0	454	0	63	0	**700**	**0**
	Degraded		0		0		7		**7**
	Total		**0**		**0**		**7**		**7**
TR351	Removed	374	0	342	0	99	0	**815**	**0**
	Degraded		0		0		0		**0**
	Total		**0**		**0**		**0**		**0**
Entire Owl Action Area	Removed	1,688	3	3,908	9	2,083	3	**7,679**	**15**
	Degraded		254 *(202)		656 *(573)		299 *(289)		**1,209 *(1,064)**
	Total		**257 *(205)**		**665 *(582)**		**302 *(292)**		**1,224 *(1,079)**

Table G-4b Owl Home Ranges		**High Quality NR (old-growth)**		**Moderate Quality NR (dense mature)**		**Foraging (mod. dense mature)**		**Total NRF**	
Activity Center ID	**Effects to Habitat**	**Existing Available Habitat**	**Acres Affected**	**Existing Available Habitat**	**Acres Affected**	**Existing Available Habitat**	**Acres Affected**	**Existing Available Habitat**	**Acres Affected**
TR094	Removed	260	0	1,173	0	485	1	**1,918**	**1**
	Degraded		4		23		59		**86**
	Total		**4**		**23**		**60**		**87**
TR098	Removed	530	3	828	9	268	2	**1,631**	**14**
	Degraded		195		503 *(493)		114		**812 *(688)**
	Total		**198**		**512 *(502)**		**116**		**826 *(702)**
TR228	Removed	345	0	324	0	294	0	**963**	**0**
	Degraded		3		4		0		**7**
	Total		**3**		**4**		**0**		**7**
TR320	Removed	525	0	1,074	0	323	0	**1,922**	**0**
	Degraded		0		0		39		**39**
	Total		**0**		**3**		**39**		**39**
TR351	Removed	570	0	1,282	0	640	0	**2,462**	**0**
	Degraded		0		0		51		**51**
	Total		**0**		**0**		**51**		**51**

Long-Term (about 10-15 years after implementation) Effects to NRF Habitat

In the spotted owl action area the thinning prescriptions within existing NRF habitat and other conifer stands not currently NRF (Map 3) would result in a net increase of moderate quality NR and foraging habitat characteristics after about 10 to 15 years (Figure G-2). This pattern for the action area is reflected in projected habitat conditions in owl territories, owl home ranges, and spotted owl Critical Habitat Unit CA-36 (Table G-5).

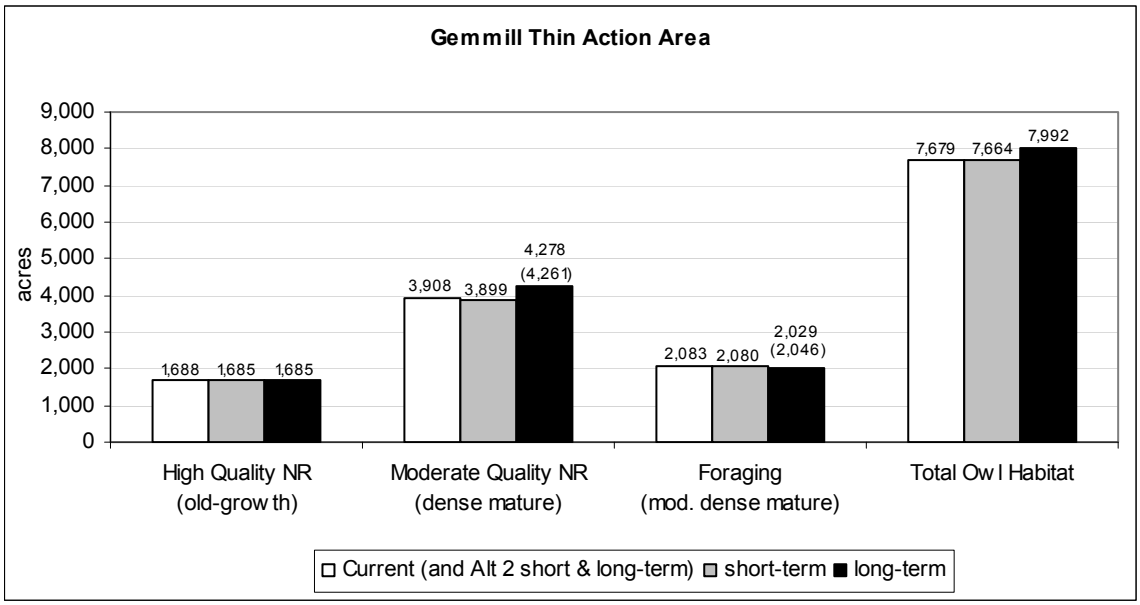


Figure G-2. Current owl habitat (white bar) conditions (Alternative 2, no action), conditions from implementing Alternative 1 (grey bar) through about 10 to 15 years (short-term) and conditions after about 10 to 15 years (black bar) within the Spotted Owl Action Area. We expect no significant changes in habitat conditions in 15+ years with Alternative 2 (no action). Projected acreages for Alternative 3 are included in parentheses. These acreages assume no severe fire events.

The proposed thinning and fuel break treatments within the overcrowded conifer stands would improve the health of these forest areas and accelerate the growth of the remaining trees by making more nutrients, and sunlight, growing space, and especially water available to the remaining trees. In addition, the smaller trees that would be removed act as fuel ladders because their crowns are closer to the ground and allow flames to climb into the canopy that could lead to loss of NRF habitat. Long-term experience with thinning conifer stands and the FVS computer model (see below) indicate that within about 10 to 15 years the thinned late-successional stands (including stands that are currently below owl foraging habitat conditions) would have redeveloped a moderate to dense canopy closure. The conifers would have developed larger, fuller crowns with larger lateral branches. Current stand and individual tree crown conditions indicate that thinned moderate quality NR would remain at the same habitat classification, thinned existing foraging habitat would grow into the moderate quality NR classification, and thinned capable habitat (not the plantations) would grow into the foraging habitat classification. These trees would ultimately provide recruitment for larger snags and logs. Understory hardwoods would have persisted in the stands adding to vertical structural complexity. Most of the preexisting large snags and logs would still be present.

The treated fuel breaks are expected to provide owl foraging habitat in both the short and long term. The fuel break treatments are proposed within existing fuel breaks created about 20 years ago. As such, most large decadent conifers, large snags and logs have been removed for fuels and fire fighter safety concerns. Thus, these areas are anticipated to develop to foraging habitat rather than NR habitat conditions because the areas would largely lack suitable nest sites.

Table G-5. Current spotted owl nesting/roosting (NR) and foraging (F) habitat, habitat conditions from just after implementation through about 10 to 15 years (short-term), and conditions after about 10 to 15 years (long-term) within affected spotted owl territories (0.7 mile radius from activity center), home ranges (1.3 mile radius form activity center), the entire owl action area and spotted owl Critical Habitat Unit CA-36. Minor long-term differences in the owl action area with Alternative 3 are indicated in *(parentheses). We expect no significant changes in habitat conditions in 15+ years with no action (i.e. Alternative 2).

Owl Activity Center ID & general effects to habitat	Habitat Quality	Territory			Home Range		
		Current	Short-Term	Long-Term	Current	Short-Term	Long-Term
TR094 **Territory**: **short-term no change & long-term increase** **Home range**: **short-term no change & long-term increase**	High Quality NR	63	63	63	260	260	260
	Mod. Quality NR	428	428	434	1,173	1,173	1,264
	Foraging	144	144	169	485	484	513
	Total NRF	**635**	**635**	**666**	**1,918**	**1,917**	**2,037**
TR098 **Territory**: **short-term decrease & long-term increase** **Home range**: **short-term decrease & long-term increase**	High Quality NR	348	345	345	530	527	527
	Mod. Quality NR	382	378	444	828	819	1,041
	Foraging	74	72	23	268	266	190
	Total NRF	**804**	**795**	**812**	**1,626**	**1,612**	**1,758**
TR228 **Territory**: **no change** **Home range**: **no change**	High Quality NR	142	142	142	345	345	345
	Mod. Quality NR	211	211	211	324	324	324
	Foraging	118	118	118	294	294	294
	Total NRF	**471**	**471**	**471**	**963**	**963**	**963**
TR320 **Territory**: **no change** **Home range**: **short-term no change & long-term increase**	High Quality NR	183	183	183	525	525	525
	Mod. Quality NR	454	454	454	1,074	1,074	1,074
	Foraging	63	63	63	323	323	336
	Total NRF	**700**	**700**	**700**	**1,922**	**1,922**	**1,935**
TR351 **Territory**: **no change** **Home range**: **short-term no change & long-term increase**	High Quality NR	374	374	374	570	570	570
	Mod. Quality NR	342	342	342	1,282	1,282	1,282
	Foraging	99	99	99	640	640	671
	Total NRF	**815**	**815**	**815**	**2,492**	**2,492**	**2,523**

Owl Activity Center ID & general effects to habitat	Habitat Quality	Territory			Home Range		
		Current	Short-Term	Long-Term	Current	Short-Term	Long-Term
Entire Owl Action Area short-term decrease & long-term increase (territory & home range not applicable)	High Quality NR	1,688	1,685	1,685	--	--	--
	Mod. Quality NR	3,908	3,899	4,278 *(4,261)	--	--	--
	Foraging	2,083	2,080	2,029 *(2,046)	--	--	--
	Total NRF	**7,679**	**7,664**	**7,992**	**--**	**--**	**--**
CHU CA-36 short-term decrease & long-term increase (Current conditions based upon the FWS baseline that does not segregate NR habitat into high/moderate quality.)	NR	8,588	8,576	8,947 *(8,930)	--	--	--
	Foraging	4,880	4,877	4,877 *(4,894)	--	--	--
	Total NRF	**13,468**	**13,453**	**13,824**	**--**	**--**	**--**

Spotted owl habitat fuels & fire effects

Up to this point, the discussion has focused on the effects to owl habitat without quantifying the interrelated issues of tree mortality, fuels and fire. This section looks at the affects of the proposed thinning compared with no treatment related to fuel build-up and the resulting effects that can be expected with a one-time fire event. The effect to canopy closure is stressed because canopy closure is an important component of owl habitat (old-growth) that we cannot avoid impacting. That is to say, we will maintain other attributes such as the largest/oldest trees, large snags/logs and viable hardwoods but a reduction in overall canopy closure is unavoidable to meet the stated purpose and need of this project.

Forest Stand Modeling

We used forest stand data collected in the Gemmill Thin project area to run the **Forest Vegetation Simulator** model (FVS) along with the **Fire and Fuels Extension to the Forest Vegetation Simulator** (FFE-FVS). FVS (stand level) is an individual tree, distance independent growth and yield model. It simulates growth and yield for most major forest tree species, forest type, and stand conditions. FVS can simulate a wide range of silvicultural treatments. We used the 'ICASCA' variant of FVS for the specific geographic area that includes the project area. FFE-FVS links FVS with models of fire behavior, fire effects, fuel loading, and snag dynamics. Model outputs include predictions of potential fire behavior and effects and estimates of snag levels and fuel loading over time. Because FFE is linked to the FVS growth model, it helped us assess both the short and long term effects of our proposed thinning and fuels treatments. More detailed information about FVS can be found at the following website: http://www.fs.fed.us/fmsc/fvs/index.php.

FVS Model limitations

- **Maintaining the largest/oldest trees**:

  The model assumes an even distribution of the trees we propose for removal. Therefore, when we modeled thinning from an existing canopy closure (or basal area) down to a target canopy

closure the model assumes the "cut trees" are relatively evenly distributed through the stand. This assumption is essentially true in the mature stands that are much more homogeneous than the older stands (or older portions of mature stands). In the mature stand treatments the model predicts logical results reasonably consistent with our past experience with similar thinning treatments. Conversely, the prescription related to the older more heterogeneous portions of the stands is more nuanced in that we identify trees for removal on both a relatively evenly distributed canopy closure (basal area) basis as well as on a much more scattered, very site specific basis dictated by individual tree's proximity to, and competition with, very large/old trees. Consequently, in the older stands the model seems to give credible results for growth, fuels, or fire behavior but shows little or no affects to the mortality rate for the largest/oldest trees in the stands even though the prescription specifically targets thinning competing trees around them. The model's assumed even distribution of "cut trees" misses this nuance of the prescription even though our field reviews of the stands shows that many of these large/old trees are already beginning to display obvious signs of distress such as fungal/insect damage and fading/yellowish foliage.

- **Hardwoods**:

  The relatively small diameter of the existing hardwoods in the lower levels of the stand structure (i.e., stratum 3) results in this important stand component being missed by the modeling even though we specifically target all hardwoods for retention. This limitation is reflected in the model under predicting canopy closure recovery after thinning. Our extensive field reviews of the project area indicate that the hardwood component would add another 10 to 20 percent canopy closure (average roughly 15%).

  We assume the model's predicted results to canopy closure after fire events are still valid because hardwoods represent a vulnerable component in the lower understory that would be lost regardless. We also assume that the predicted mortality of the smaller size class trees with no treatment includes hardwoods.

- **Low density conifer size classes**:

  Because of their low density our sampling failed to pick up conifers within the 18 through 26 inch dbh size classes within mature stands and 16 through 20 inch dbh size classes within the older stands. Intensive field reviews of the project area revealed that these size classes do occur, but at very low density. We did not consider this to be a limiting factor in the usefulness of the modeling. The only time these trees would be considered for removal is in the rare occasion when they occur in direct competition with much larger predominant (legacy) conifers or they occur in temporary landings (<24"). Additionally, our data collection did not account for conifers below roughly 8 inches dbh. Field reviews indicate that this heavily suppressed 'sapling' component occurs at a density of well over 200 trees per acre.

Modeling Results

Fuel Build-Up (No Fire)

Based upon intense field reviews and long-term experience, we see an existing excessive fuel load in the stands proposed for thinning and anticipate this to worsen with time as competition for limited site resources leads to tree mortality. Our modeling indicates that without treatment dying trees will increase surface fuels from an existing 17 tons per acre to about 100 tons per acre in mature stands and from an existing 44 tons per acre to about 57 tons per acre in the older stands while the proposed thinning would reduce this fuel build-up during the 50 year timeframe that was modeled (Figure G-3). This accumulation of coarse woody material could be viewed as a positive trend for old-growth habitat. However, the projected mortality leading to this accumulation of material involves primarily smaller understory trees (i.e., those targeted for thinning) that would not provide 'large' snags/logs associated with old-growth habitat. Additionally, the tree mortality with no thinning would have a negative impact on canopy closure, another important component of old-growth habitat.

Canopy Closure (No Fire)

Intense field reviews, long-term experience and our modeling indicate that even without treatment, canopy closure will drop as competition for limited site resources leads to tree mortality. Within about 15 years in mature stands and about 10 years in older stands projected mortality in the untreated scenario will reduce canopy closure to or below the projected canopy closure that would result from the proposed thinning (Figure G-4). We project higher canopy closures in the treated stands than in untreated stands from about 20 years on, especially in the mature stands. This indicates that either we remove trees or trees will fall out of the stands through mortality. Allowing the mortality to 'thin' the stands would increase fuel build-up and maintain dense fuel ladders up into the overstory.

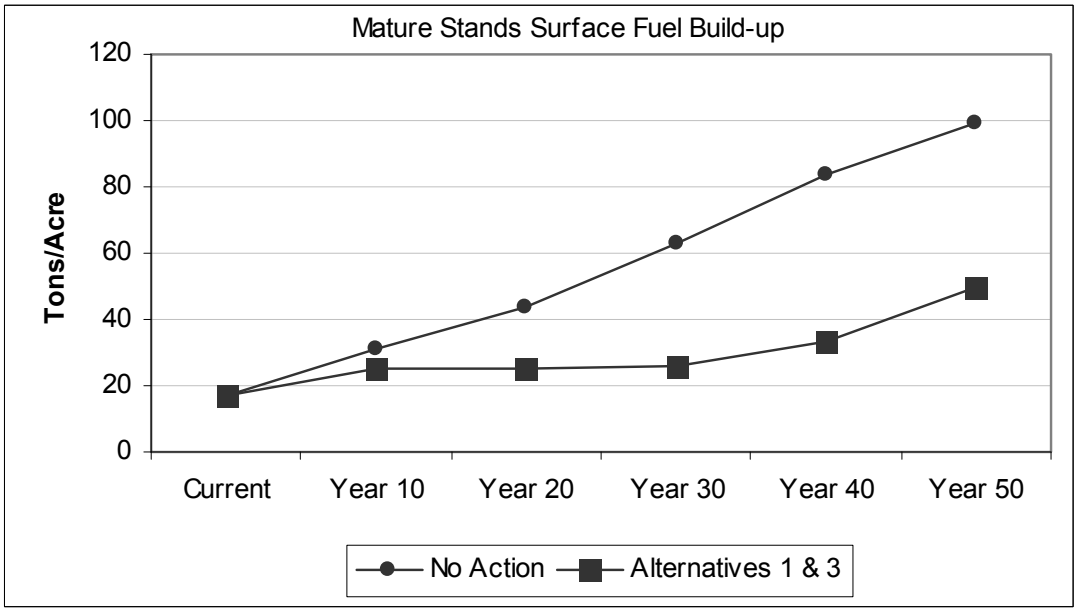
What Happens with Fire

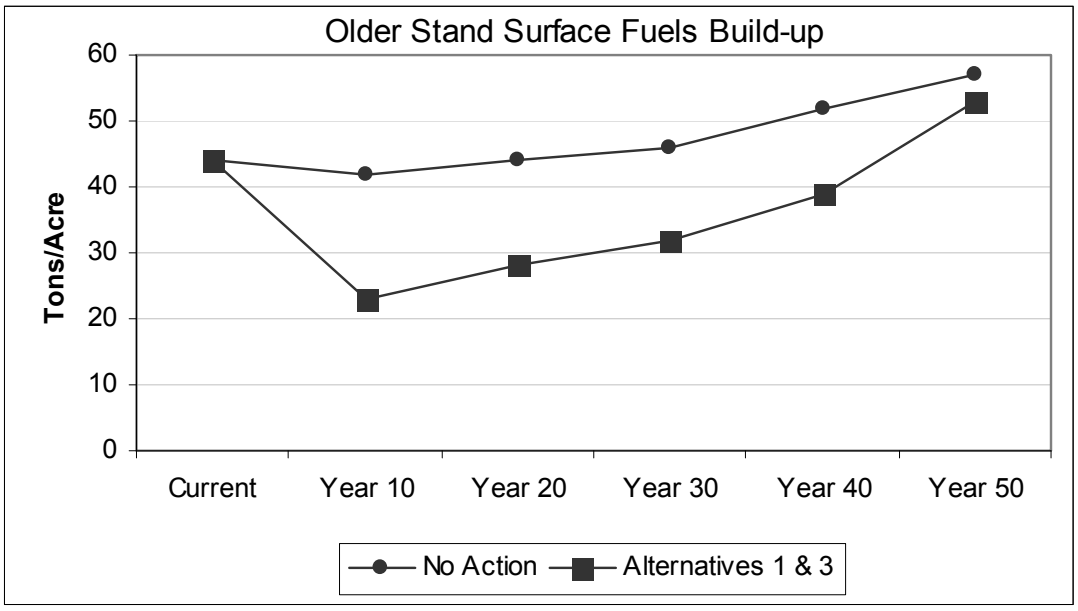
The proposed thinning treatments will dramatically reduce the loss of overstory conifers (canopy closure) due to late summer fire into the future (Figure G-5). That is to say, fire at this point in time in untreated stands would reduce canopy closure well below owl NR suitability and below even connectivity habitat conditions in roughly 5 years (mature stands) to 25 years (older stands) of continuing fuel build-up. Conversely, because of the reductions of existing/future fuels coupled with the increased vigor of the remaining trees, fire after the thinning treatments would not reduce canopy below owl NR habitat conditions out past about 45 years of fuel build-up in the mature stands and canopy closure would be at or just below NR habitat conditions in the older stands for the same time period. Note that Figure G-5 depicts projected effects from a one-time fire event. For example, a "year 30 fire" assumes no fires for the previous 30 years.

A synopsis of these modeling results shows that:

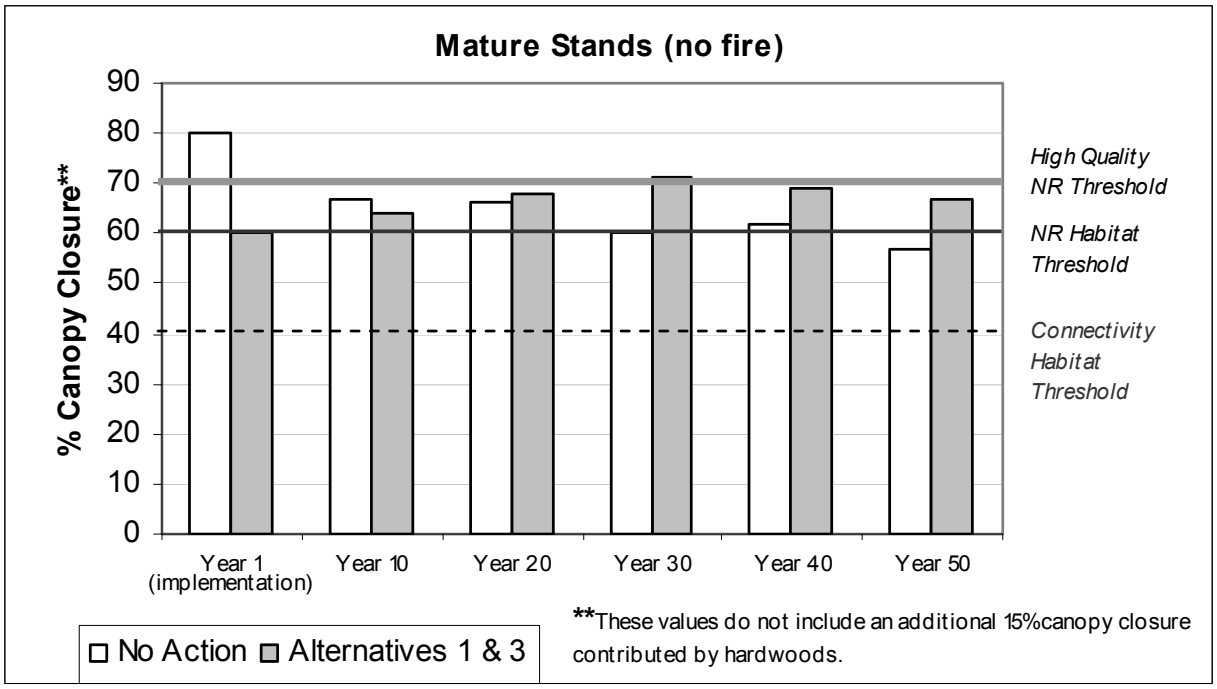
- While our proposed thinning treatments would reduce canopy closure, the same level of canopy reduction would be quickly exceeded if we did nothing.

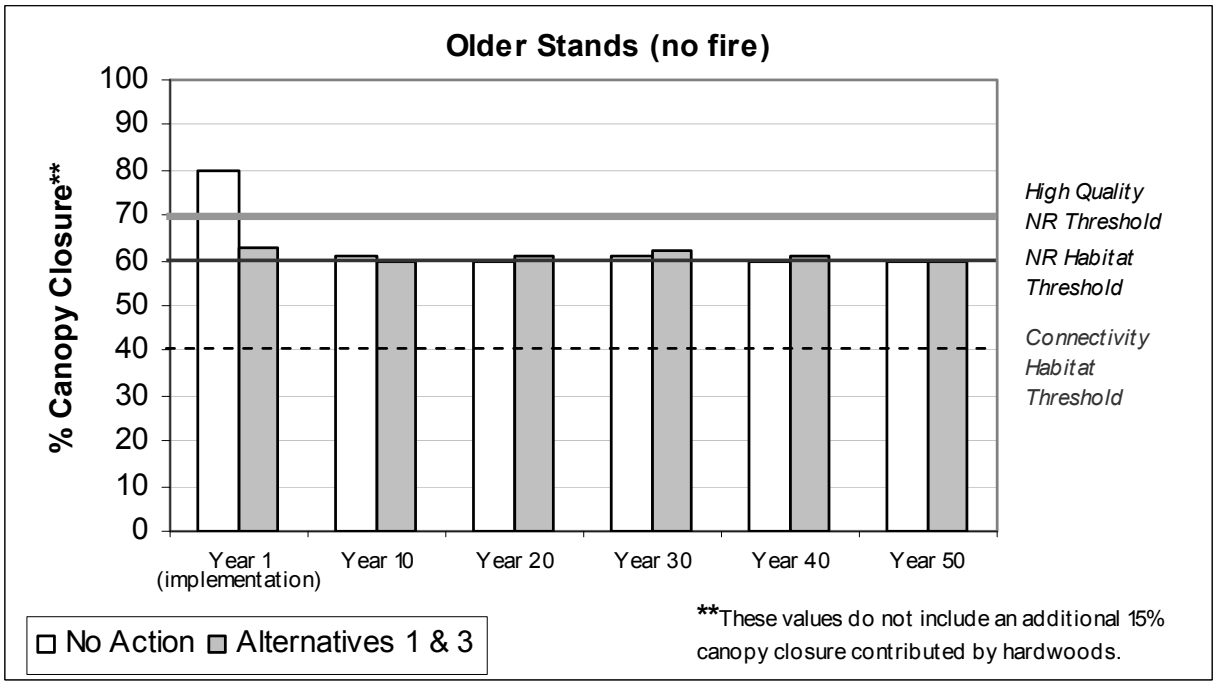
- By thinning the stands, smaller diameter snags/logs would be reduced with a concurrent reduction of existing and future fuel. These smaller diameter trees would either die 'naturally' or be removed through thinning. They would not provide 'large' snags/logs associated with old-growth habitat.
- The reduction in fuels and the concurrent increase in the vigor of the remaining trees would allow the treated stands to better survive late-summer fire events and provide owl habitat into the future. Without thinning, the stands would not provide owl habitat after a late-summer fire.



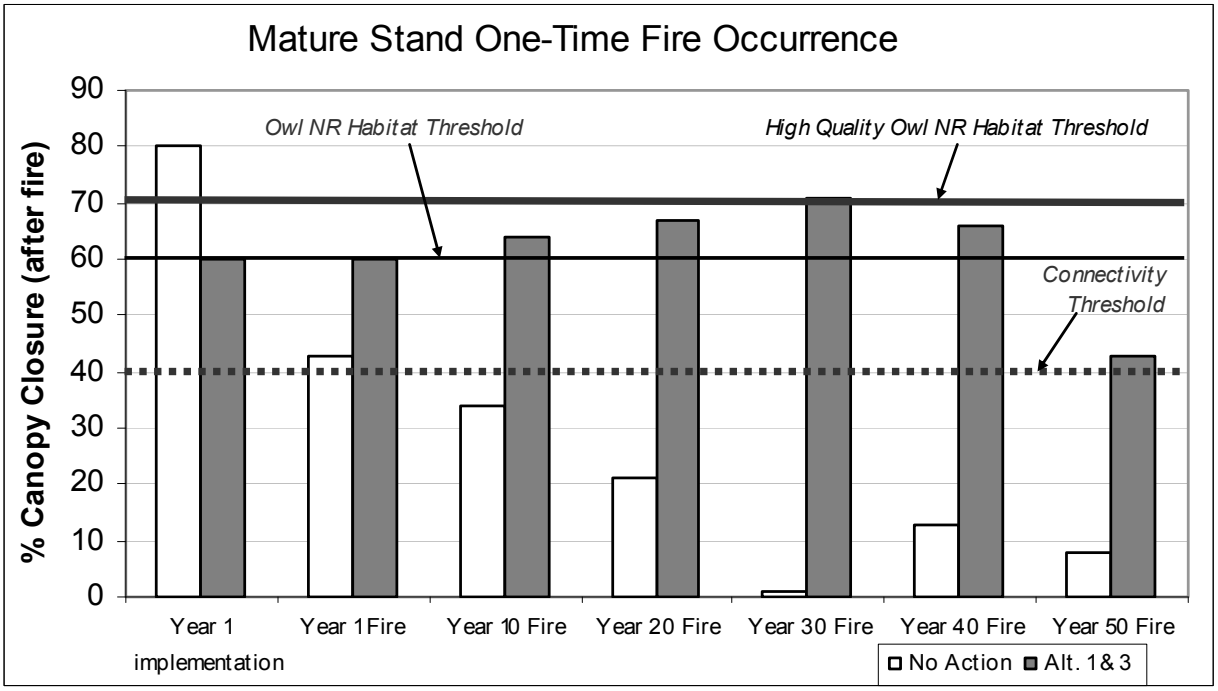


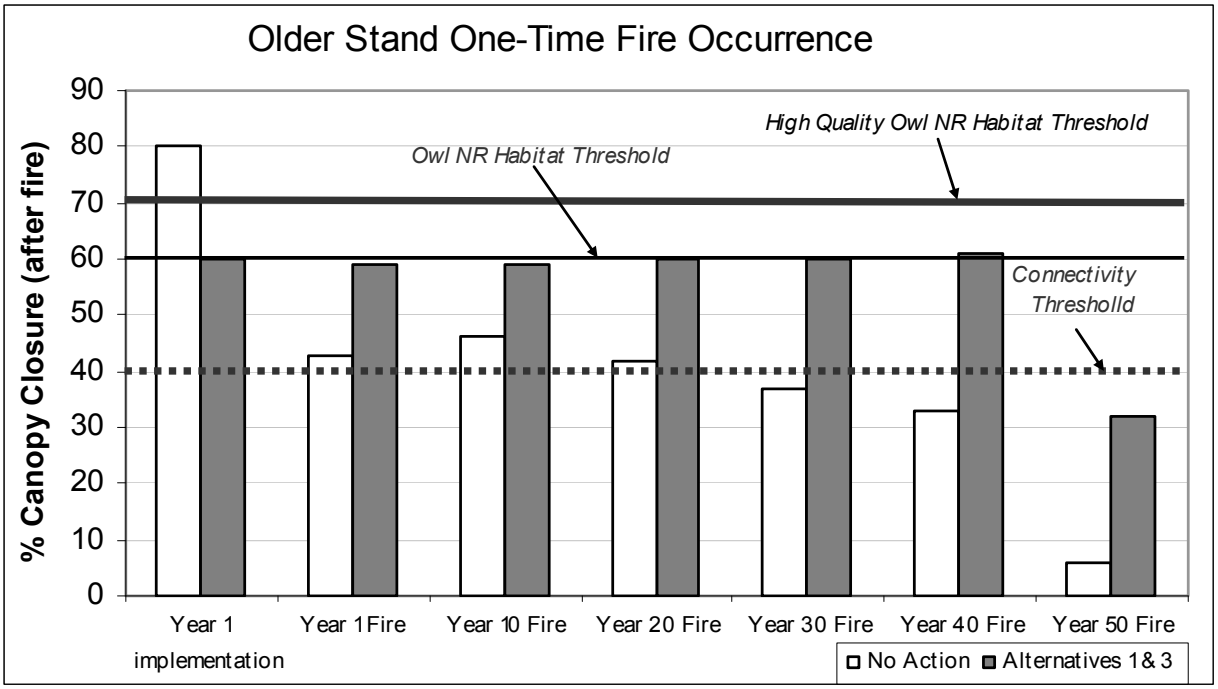
Figures G-3. The proposed thinning treatments within dense forest stands would reduce fuel build-up into the future. Existing large snags and logs as well as large overstory conifers will be retained to provide owl and fisher nesting and denning sites and large snags and logs into the future





Figures G-4. The proposed thinning treatments within dense forest stands maintain a moderate to dense canopy closure. Note that this modeling does not include an additional 15% canopy closure contributed by hardwoods that would be retained. Moderate to high canopy closure is a key habitat component for species associated with old-growth conifer forests such as the northern spotted owl and Pacific fisher. Large overstory conifers will be retained to provide owl and fisher nesting and denning sites and large snags and logs into the future





Figures G-5. The proposed thinning treatments within dense forest stands will dramatically reduce the loss of overstory conifers (canopy cover) due to fire into the future. Moderate to high canopy closure is a key habitat component for species associated with old-growth conifer forests such as the northern spotted owl and Pacific fisher. Large overstory conifers are those trees that will provide owl and fisher nesting and denning sites and large snags and logs into the future. Late summer fire was modeled because this is the driest time of the year and the period when most catastrophic wildfires occur in the project area vicinity.

Competitors & Predators

The probability of predation by great horned owls on spotted owls may be temporarily increased because thinning would provide more open stands that the larger, less maneuverable great horned owl prefers (USDI 1992a).

West Nile Virus

There is no known connection between WNV and forest management practices and there are no known cases of spotted owl mortality due to this disease at this time. Should WNV begin to impact owls in the area, the short-term negative effects related to this project may be compounded.

Cumulative Effects

The existing conditions related to spotted owl habitat included in this document incorporate past actions that led to those conditions. Mid-mature conifer forest dominates Federal land within the roughly 16,868-acre action area because of historic timber harvest activities and fire. The action area includes approximately 4,310 acres of private property has been heavily harvested and is dominated by very dense pine and mixed conifer forest that provides owl connectivity habitat The California Department of Forestry and Fire Protection (CDF) web site (http://www.fire.ca.gov/ResourceManagement/THPStatusUpload/THPStatusTable.html) lists no private timber harvest plans in the action area. Nonetheless, we assume that intense timber management will continue on this private land and in the foreseeable future older conifer forest habitat within the action area will likely be restricted to 15,784 acres of federal forest land. Existing non-conifer areas such as hardwood and shrub dominated habitats and riparian vegetation would remain largely intact on both federal and private lands. No Forest Service projects that would negatively impact existing owl or old-growth habitat are planned in the action area in the foreseeable future.

Determinations

Northern spotted owl

It is my determination that the proposed actions **may affect and would likely adversely affect the northern spotted owl** based upon the following rationale: Existing NRF habitat would be reduced (maximum of about 12 acres), 'slightly' degraded (910 acres) in the short-term (roughly10-15 years), and the quantity and relative quality of NRF habitat would be increased in the long-term (after roughly 10-15 years). The probability of losing owl habitat due to fire would be reduced. Direct harm or disturbance to breeding activities would be avoided with a limited operating period.

Northern spotted owl critical habitat

It is my determination that the proposed actions **would adversely affect Designated Critical Habitat.** Existing NRF habitat would be reduced (maximum of about 12 acres), 'slightly' degraded (886 acres) in the short-term (roughly10-15 years), and the quantity and relative quality of NRF habitat would be increased in the long-term (after roughly 10-15 years) within CHU CA-36. The probability of losing owl

habitat due to fire would be reduced. CHU CA-36 is expected to function at current levels in the short-term and improve in the long-term.

Marbled Murrelet

It is my determination that the proposed actions **would have no effect on the marbled murrelet** because the project area lies well outside the murrelet's known or expected range.

Marbled Murrelet critical habitat

It is my determination that the proposed actions would **not affect designated marbled murrelet critical habitat** because no designated critical habitat lies within areas proposed for treatment.

California Red-legged Frog

It is my determination that the proposed actions **would have no effect on the California red-legged frog** because the project area lies well outside the frog's known or expected range.

California Red-legged Frog critical habitat

It is my determination that the proposed actions would **not affect designated red-legged frog critical habitat** because no designated critical habitat lies within areas proposed for treatment (USDI 2006).

Management Recommendations

- Given the design criteria included during project development, there are no management recommendations related to the actual proposed actions.
- Continue owl surveys to monitor individual owl pair response to the habitat alteration.

Contributors

- Jeff Paulo, Silviculturist, South Fork Management Unit, Shasta-Trinity National Forest.
- Bill Clark, Fuels Officer, South Fork Management Unit, Shasta-Trinity National Forest.
- James P. Gonzalez, Assistant Fuels Officer, South Fork Management Unit, Shasta-Trinity National Forest.
- Loren Everest, Fishery Biologist, Trinity River Management Unit, Shasta-Trinity National Forest.
- Donnie R. Ratcliff, Assistant Fishery Biologist, Shasta-Trinity National Forest.
- Kelly Wolcott, Forest Wildlife Biologist, Shasta-Trinity National Forest.

Literature

Agee, James K. 1993. Fire Ecology of Pacific Northwest Forests. 1st ed. Island Press.

Anthony, R.G., R.L. Knight, G.T. Allen, B.R. McClelland and J.I. Hoges. 1992. Habitat use by nesting and roosting bald eagles in the Pacific Northwest. Trans. N. Am. Wildl. Nat. Res. Conf. 68pp.

Blakesley, J.A., Franklin, A.B., and R.J. Gutiérrez. 1992. Spotted owl roost and nest site selection in northwestern California. 1992. Journal of Wildlife Management, 56(2):388-392.

Courtney, S.P.; J.A. Blakesley; R.E. Bigly; M.L. Cody; J.P. Dumbacher; R.C. Fleischer; A.B. Franklin; J.F. Franklin; R.J. Gutierrez; J.M. Marzluff; and L. Sztukowski. 2004. Scientific evaluation of the status of the northern spotted owl. Sustainable Ecosystem Institute; Portland, Oregon.

Damiani, Christine; Danny C. Lee, and Sandra L. Jacobson. 2007. Effects of noise disturbance on northern spotted owl reproductive success. Final Report to the U.S. Forest Service. USDA Forest Service, Pacific Southwest Research Station, Redwood Sciences Laboratory, Arcata, CA; USDA Forest Service, Eastern Forest Environmental Threat Assessment Center, Asheville, NC. September 28, 2007 (unpublished document).

Forsman, E.D., Meslow, E.C., and H.M. Wight. 1984. Distribution and biology of the spotted owl in Oregon. Wildlife Monographs 87:1-64.

Franklin, A.B., D.R. Anderson, R.J. Gutiérrez, and K.P. Burnham. 2000. Climate, habitat quality, and fitness in northern spotted owl populations in northwestern California. Ecological Monographs 70(4):539-590.

Freel, M. 1991. A literature Review for the Management of the Marten and Fisher on National Forests in California. Unpublished document. USDA Forest Service, San Francisco, CA.

Graham, Russell T. 1994. "Silviculture, Fire and Ecosystem Management." in Assessing Forest Ecosystem Health in the Inland West Binghamton, New York: Food Products Press, 339-51.

Graham, Russell T. and others, 1999. "The Effects of Thinning and Similar Stand Treatments on Fire Behavior in Western Forests.", PNW-GTR-463 (1999). Portland, Oregon: U.S. Department of Agriculture, Forest Service, Pacific Northwest research Station.

Graham, Russell T., Sarah McCaffrey, and Theresa B. Jain, 2004. "Science Basis for Changing Forest Structure to Modify Wildfire Behavior and Severity.", RMRS-GTR-120 (2004). Rocky Mountain Research Station: U.S. Forest Service.

Gutiérrez, R.J. 1996. Biology and distribution of the northern spotted owl. Pages 2-5 *in* E.D. Forsman, S. DeStefano, M.G. Raphael, and R.J. Gutierrez (eds). Studies in Avian Biology No. 17.

LaHaye, W.S. and R.J. Gutiérrez. 1999. Nest sites and nesting habitat of the northern spotted owl in northwestern California. Condor 101(2):324-330.

Meyer, J.S., Irwin, L.L., and M.S. Boyce. 1998. Influence of habitat abundance and fragmentation on northern spotted owls in western Oregon. Wildlife Monographs 139:1-51.

Oliver, Chadwick D. and Bruce C. Larson. 1996. Forest Stand Dynamics. 2nd ed. Biological Resource Management Series, McGraw-Hill.

Ralph, C. John; Hunt, George L., Jr.; Raphael, Martin G.; Piatt, John F., Technical Editors. 1995. Ecology and conservation of the Marbled Murrelet. Gen. Tech. Rep. PSW-GTR-152. Albany, CA; Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 420 p.

Solis, D.M., and R.J. Gutiérrez. 1990. Summer habitat ecology of northern spotted owls in northwestern California. The Condor 92:739-748.

Thomas, J.W., E.D. Forsman, J.B. Lint, E.C. Meslow, B.R. Noon, and J. Verner. 1990. A Conservation Strategy for the Northern Spotted Owl. Interagency scientific committee to address the conservation of the northern spotted owl.

U.S. Department of Agriculture, Forest Service and U.S. Department of the Interior Fish and Wildlife Service. 1991. Protocol for surveying for spotted owls in proposed management activity areas and habitat conservation areas, March 12, 1991.

U.S. Department of Agriculture, Forest Service. 1995. Shasta-Trinity National Forests Land and Resource Management Plan. Shasta-Trinity National Forests, Redding CA.

U.S. Department of Agriculture, Forest Service et al. 1997, Shasta-Trinity National Forest - Forest Wide LSR Assessment, Shasta-Trinity National Forest, Redding, CA

U.S. Department of Agriculture, U.S. Department of the Interior, U.S. Department of Commerce, and the Environmental Protection Agency. 1993. Forest Ecosystem Management: An Ecological, Economic, and Social Assessment. Report of the Forest Ecosystem Management Assessment Team. Forest Service, Fish and Wildlife Service, National Marine Fisheries Service, National Park Service, Bureau of Land Management, Environmental Protection Agency.

USDA Forest Service and USDI Bureau of Land Management. 1994. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl (Northwest Forest Plan). Portland, Oregon.

USDI Fish and Wildlife Service. 1990a. The 1990 status review: northern spotted owl: *Strix occidentalis caurina*. Report to the U.S. Fish and Wildlife Service, Portland, Oregon. 95 pages.

U.S. Department of the Interior Fish and Wildlife Service. 2002. Recovery Plan for the California Red-legged Frog. U.S. Fish and Wildlife Service, Portland, Oregon. 173pp.

U.S. Department of the Interior Fish and Wildlife Service. 1997. Availability of the draft recovery plan for the Shasta crayfish (*Pacifastacus fortis*) for review and comment. Federal Register Vol. 62, No. 189.

U.S. Department of the Interior Fish and Wildlife Service. 1994. Final rule: endangered and threatened wildlife and plants; determination of endangered status for the conservancy fairy shrimp, longhorn fairy shrimp, and the vernal pool tadpole shrimp; and threatened status for the vernal pool fairy shrimp. Federal Register 59:48136.

U.S. Department of the Interior. 1992a. Recovery Plan for the Northern Spotted Owl. Final Draft. Portland, Oregon: U.S. Department of the Interior. 2 Volumes.

U.S. Department of the Interior Fish and Wildlife Service. 1986. Pacific Bald Eagle Recovery Plan. U.S. Fish and Wildlife Service, Portland, Oregon. 163pp.

U.S. Department of the Interior Fish and Wildlife Service. 1984. Recovery Plan for the valley elderberry longhorn beetle. Portland Oregon.

Zabel, C. J., J.R. Dunk, H.B. Stauffer, L.M. Roberts, B.S. Mulder, and A. Wright. 2003. Northern spotted owl habitat models for research and management application in California (USA). Ecological Applications 13(4):1027-1040.

Attachment 1: Listed/Proposed Threatened and Endangered Species for Trinity County (Candidates Included) _____

November 20, 2007

Document number: 470482137-182948

KEY:

(PE) Proposed Endangered Proposed in the Federal Register as being in danger of extinction

(PT) Proposed Threatened Proposed as likely to become endangered within the foreseeable future

(E) Endangered Listed in the Federal Register as being in danger of extinction

(T) Threatened Listed as likely to become endangered within the foreseeable future

(C) Candidate Candidate which may become a proposed species Habitat Y = Designated, P = Proposed, N = None Designated

* Denotes a species Listed by the National Marine Fisheries Service

Type	Scientific Name	Common Name	Category	Critical Habitat
Plants	*Arabis macdonaldiana*	McDonald's rock-cress	E	N
Fish	*Hypomesus transpacificus*	delta smelt	T	Y
	*Oncorhynchus kisutch**	S. OR/N. CA coho salmon	T	Y
	*Oncorhynchus mykiss**	Central Valley steelhead	T	Y
	*Oncorhynchus mykiss**	Northern California steelhead	T	Y
	*Oncorhynchus tshawytscha**	CA coastal chinook salmon	T	Y
	*Oncorhynchus tshawytscha**	Central Valley fall/late-fall chinook salmon	C	N
	*Oncorhynchus tshawytscha**	Central Valley spring-run chinook salmon	T	Y
	*Oncorhynchus tshawytscha**	winter-run chinook salmon	E	Y
Amphibians	*Rana aurora draytonii*	California red-legged frog	T	Y
Birds	*Brachyramphus marmoratus*	marbled murrelet	T	Y
	Coccyzus americanus	Western yellow-billed cuckoo	C	N
	Strix occidentalis caurina	northern spotted owl	T	Y
Mammals	*Martes pennanti pacifica*	Pacific fisher	C	N

Attachment 2: Gemmill Thin Wildlife Biological Assessment____

Upper Hayfork Creek 5th Field Watershed

Analysis and Recommendations for the standard and guideline:

Provide for retention of old-growth fragments in watersheds where little remains

Summary

Total late-successional conditions in the Upper Hayfork Creek Watershed are currently well above the 15% S&G threshold of concern. Total existing late-successional forest (dominated by mature forest) comprises about 75 percent of federal forest land in the watershed. However, old-growth--that provides high quality habitat for species associated with late-successional forests such as the northern spotted owl--comprises only 2,527 acres or less than 10 percent of the 27,150 acres of the federal forest land in the watershed. Therefore, removal of existing old-growth is not recommended at this time unless there is a compelling reason to do so.

Prepared by __/s/ Thomas A. Quinn_____ Date_10-29-07_____
Thomas A. Quinn
Wildlife Biologist
Trinity River Management Unit
Shasta-Trinity National Forest

Introduction

This document presents an analysis of the current condition of late-successional conifer habitat (that includes old-growth as an important subset) within the Upper Hayfork Creek 5th field watershed (the watershed). Recommendations for meeting and maintaining future options to meet the intent of the ***provide for retention of old-growth fragments in watersheds where little remains*** standard and guideline (15% S&G, ROD page C-44) are included.

The threshold of concern with the 15% S&G is the retention of at least 15 percent of federal forest land within a 5th field watershed in late-successional habitat. The first paragraph of the S&G describes the importance of old-growth habitat in providing for biological and structural diversity across the landscape and goes on to state that it is **prudent** to retain what little remains of this age class within landscapes where it is currently very limited. However, the second paragraph of the S&G makes it clear that late-successional (including both mature and old-growth; see below) constitute the numerator in calculating the percentage of federal forest land (i.e., the denominator) meeting this S&G.

Definitions & Assumptions

The *Shasta-Trinity Land and Resource Management Plan (Forest Plan) database* (**LMP-90 database**) was used to assess Forest Service land within the watershed.

- **Federal Forest Land is defined as federal land that is now, or is capable of becoming, at least 10 percent stocked with forest trees (i.e., conifers) and that has not been developed for nontimber use. This acreage is the base (denominator) used to calculate the 15 percent retention S&G.** Within the watershed, Forest Service land of the forest types (LMP-90 database "*Vegtype1"*) Douglas-fir, mixed conifer, ponderosa pine, and white fir qualify as Federal Forest Land.
- **Late-Successional Forest** consists of forest seral stages that include old-growth and mature age classes.
  - **Old-Growth** is defined as a forest stand usually at least 180-220 years old with moderate to high canopy closure; a multilayered, multispecies canopy dominated by large overstory trees; high incidence of large trees, some with broken tops and other indications of old and decaying wood; numerous snags; and heavy accumulations of wood, including large logs on the ground. **Within the watershed, all size class 4 (or greater) stands with a canopy closure of G or N are assumed to be old-growth** (LMP-90 database "Vegsize" and "Vegden", see below).
  - **Mature Forest** is defined as a mappable (>10 acres) stand of trees for which the annual rate of growth has peaked; generally greater than 80 years old but not yet old-growth. Mature stands generally contain trees with a smaller average diameter, less age class variation, and less structural complexity than old-growth stands of the same forest type. **Within the watershed, all size class 3 or greater stands and size class 4 or above that are not old-growth are assumed to be mature stands** because they are typically over 80 years old. The definition of "mature" does not include a canopy closure criterion: Older mature stands with relatively high canopy closure (e.g., "*Vegden*" G and N, see below) typically provide suitable habitat for species associated with old-growth forests such as the northern spotted owl; "Vegden" P/S stands typically do not.

LMP-90 Database Assumptions

The Shasta-Trinity Land and Resource Management Plan (Forest Plan) database (LMP-90 database) is the best existing and available tool for vegetative analysis of Forest Service land within an area as large as the Upper Hayfork Creek Watershed. Using this database to analyze existing vegetative conditions as they relate to old-growth habitat requires a number of basic assumptions that long-term local experience suggests are valid for analyses at this scale. The information available in the LMP-90 database represents aerial photo interpretation from 1975 photos. The interpretation was conducted with primarily timber production interests in mind. In 1990 and 1992 the database was updated to include recent harvest units (i.e., plantations) and stand replacing fires. Stand attributes in the database (the codes included in the LMP-90 database are included in parentheses) used to infer potential and existing late-successional forest conditions were: **vegetation type** (LMP-90 database *Vegtype1*), **crown size** (LMP-90 database *Vegsize*), **canopy closure** (*Vegden*).

- ***Vegtype1* (vegetation type)**: Within the Upper Hayfork Creek Watershed only "commercial conifer" types typically have the potential to qualify as Federal Forest Land and provide habitat for species associated with old-growth conifer forests. That is to say, only these types move through the successional stages resembling those described on pages B-2 through B-4 in the ROD and develop old-growth stand structure and composition as described on page B-2 (and the Glossary) of the ROD. Within the watershed Federal Forest includes ponderosa pine, Douglas-fir, mixed conifer, white fir and plantation vegetation types. Nonconifer and noncommercial conifer types almost never achieve the size, canopy closure, or generally complex vertical structure associated with old-growth habitat.
- ***Vegsize* (overstory conifer crown diameter)**: Overstory conifer crown diameter classes included in the LMP-90 database are a reasonable indicator of general stand age and their use is the only currently available tool for estimating seral stage development over large areas. Size classes are the major indicator of the level of decadence within stands (e.g., snags, logs, broken-top trees, etc.) since decadence is largely a function of stand age. That is to say, stands with larger trees are typically older than stands with smaller trees. Size class 4 (or greater) are typically old enough to have developed these attributes of old-growth conifer forests. Stands in size class 3 on sites highly capable of growing trees often are at least 21 inches dbh (diameter breast height) considering growth since 1975. Generally, if these stands are a result of natural regeneration (e.g., having developed after a stand replacing fire as opposed to past clearcutting) they include legacies from the previous stands (e.g., large trees, snags, logs, etc.) and likely provide at least some of the ecological roles of old-growth. Size classes 3 and 4 provide late-successional forest (i.e., Federal Forest Land) that contribute to meeting the 15% S&G although these stands with lower canopy cover may not provide suitable habitat for species associated with old-growth forests such as the northern spotted owl (see Figures A1 and A2).

Crown Diameter Classes:

  - 0 = shrub, forb, grass, noncommercial conifer, hardwood, and nonvegetated (no old-growth potential; not federal forest land).
  - 1 = 0-5 foot crown diameter, seedling sapling; stand establishment stage; includes most contemporary plantations (future old-growth potential; federal forest land).
  - 2 = 6-12 foot crown diameter, poles; growth and maturation with little or no natural thinning; includes minor acreages of contemporary plantations (future old-growth potential; federal forest land).
  - **3** = 13-24 foot crown diameter, small to medium timber; continued growth and maturation and beginning natural thinning (current mature forest).
  - **4 or greater** = >24 foot crown diameter, large sawtimber; transition stage (current old-growth forest).
- ***Vegden* (overstory conifer canopy cover)**: Moderate to dense canopy closure is typical of old-growth habitat in the Upper Hayfork Creek Watershed. Local experience strongly suggests that

canopy closure classes N & G typify current old-growth habitat. These classes were originally assigned based on predominant crown cover of only commercial conifer overstory species. When the understory component is included along with 20+ years of growth these two classes commonly have a total canopy closure above 60 percent. In addition, the understory increases the complexity of vertical structure (an important attribute of old-growth habitat). Class P and S stands typically do not provide suitable habitat for species associated with old-growth forests such as the northern spotted owl (see Figures A1 and A2).

Canopy Closure Classes:

- S = <20%
- P = 20-39%
- **N** = 40-69%
- **G** = ≥70%

Size & Canopy Closure Classes Related to Old-Growth Habitat

Older, denser conifer stands typically provide better habitat conditions for species associated with old-growth forests such as the northern spotted owl.

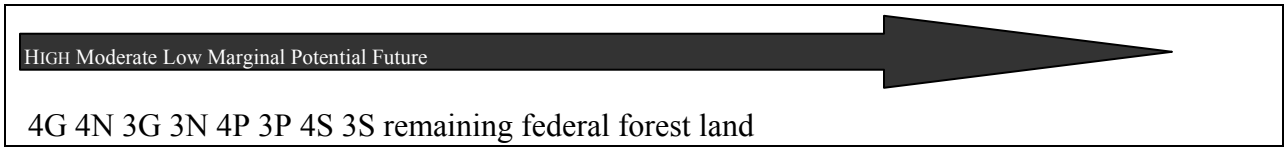


Figure G-A1. The general relationship between old-growth habitat quality and size class & canopy closure (from left to right, higher to lower quality)

Size & Canopy Closure Classes related to Northern Spotted Owl Late-Seral Management Indicator Species (MIS) Habitat Quality

In general, spotted owl habitat quality improves with age and canopy closure. **NOTE**: The terms "late seral" or "late seral stage" used in the LRMP are synonymous with the term **late-successional** in the context of this document. Late-successional is the term used in the Northwest Forest Plan and most other supporting documents.

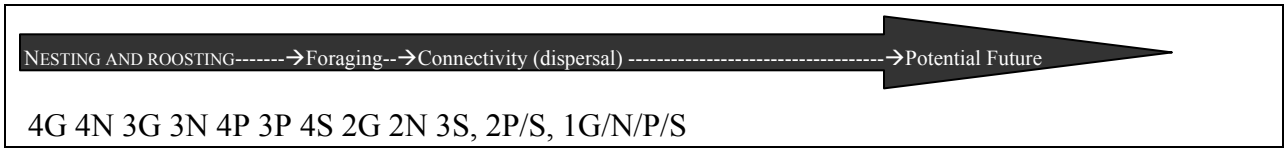


Figure G-A2. The general relationship between late-successional (late seral) MIS spotted owl habitat quality and size class & canopy closure to (from left to right, higher to lower quality)

Current Conditions

Current conditions in the Upper Hayfork Creek Watershed are well above the 15% S&G threshold of concern. The 32,309-acre Upper Hayfork Creek Watershed includes about 2,738 acres of private property

and 29,571 acres of Forest Service land of which about 27,150 acres are vegetation types that are 'federal forest land' (Figure A3). This federal forest land is the denominator in calculating the S&G. Total existing late-successional forest (dominated by mature forest, size class 3, Table G-A1 and Figure G-4) that contributes to meeting the 15% S&G comprises about 78 percent of federal forest land in the watershed. The percentage drops to about 40 percent if only moderately dense or dense late-successional forest (that typically provide suitable habitat for species associated with old-growth forests such as the northern spotted owl) are included. High quality old-growth habitat (4N/G) comprises only 2,527 acres or less than 10 percent of the federal forest land in the watershed.

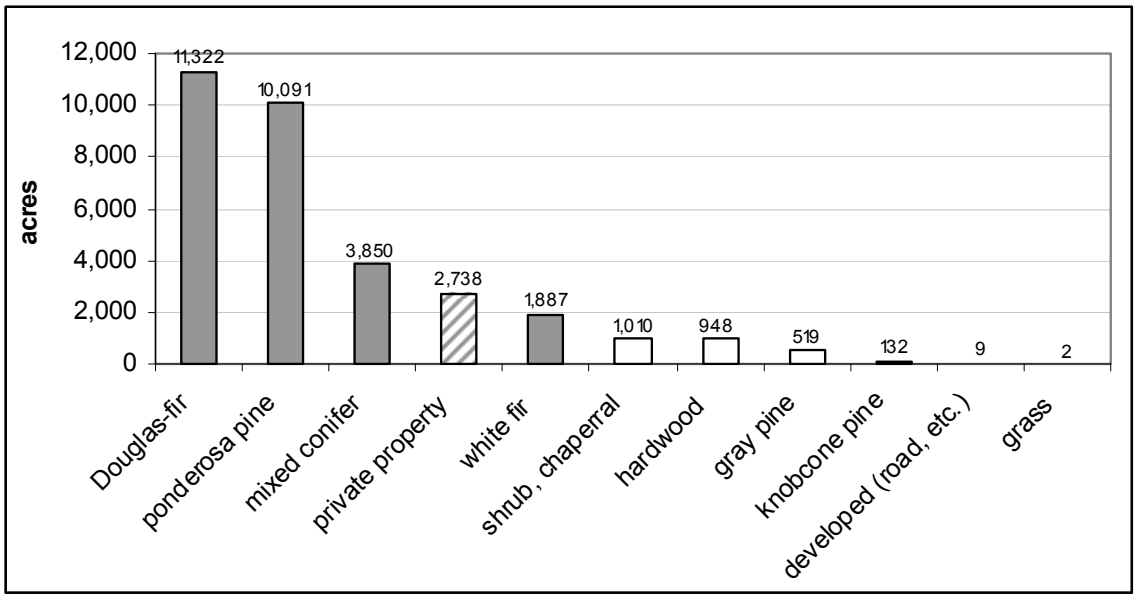


Figure G-A3. Major Vegetation Types in the Upper Hayfork Creek Watershed. Vegetation types that qualify as Federal Forest Land (dark shaded bars) supply the denominator in calculating the 15% S&G. Private property is included as a "vegetation type" in this graph but is not 'Federal Forest Land' and is not germane to the S&G.

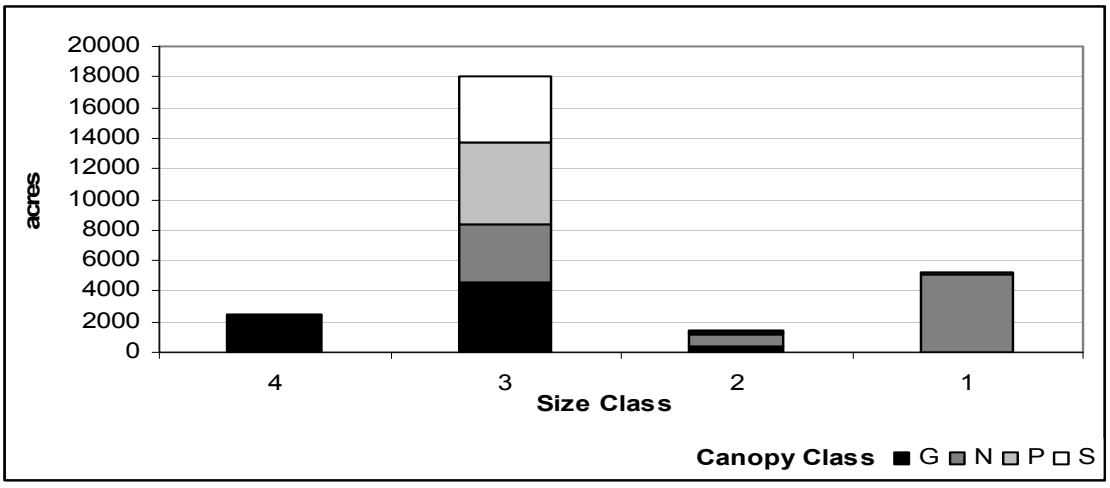


Figure G-A4. Size Class and Canopy Closure of the Federal Forest Land in the Upper Hayfork Creek Watershed. Size Classes 3 & 4 are currently late-successional habitat that contributes to meeting the 15% S&G.

Table G-A1. Size Class and Canopy Closure Distribution within the Upper Hayfork Creek Watershed. Includes only federal land that is now, or is capable of becoming, at least 10 percent stocked with forest trees and that has not been developed for nontimber use (i.e., 'Federal Forest Land'). Size classes 3 & 4 are currently late-successional and contribute to meeting the 15% S&G.

Size Class	Canopy Closure				
	G	N	P	S	Total
≥4	2,412	115	11	0	2,538
3	4,585	3,770	5,334	4,341	18,031
2	421	729	126	99	1,376
1	0	5,075	106	25	5,206
Total Federal Forest Land					**27,150**

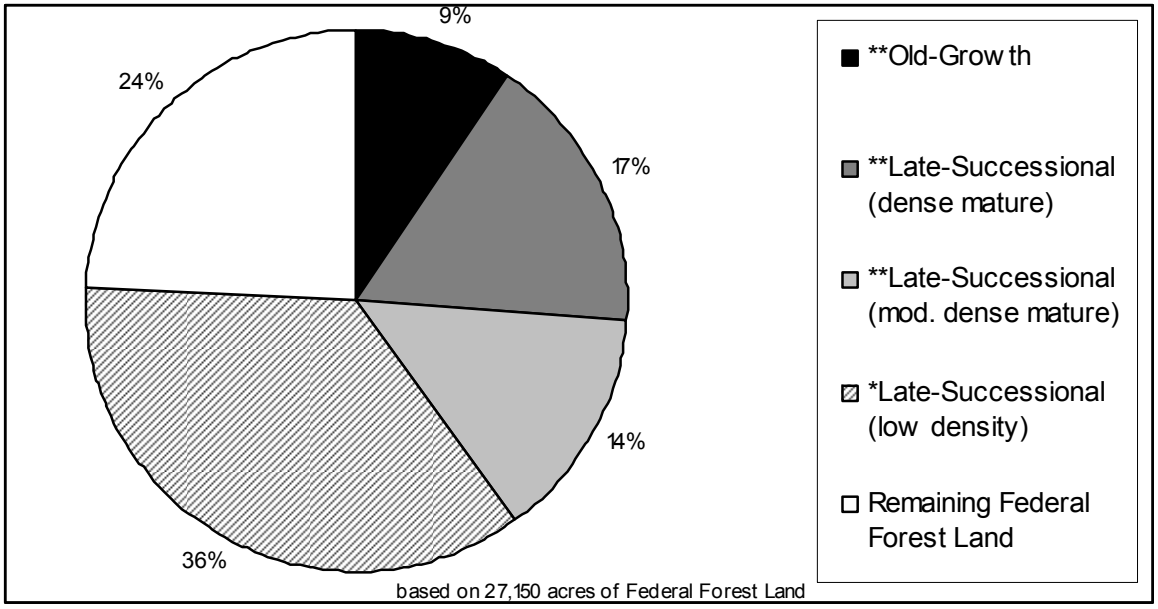


Figure G-A5. The percentages of late-successional forest in the Upper Hayfork Creek Watershed segregated by relative habitat quality (from best to worst: old-growth, dense mature, moderately dense mature low density late-successional forest).

**These acres currently contribute to meeting the 15% S&G and provide suitable habitat for species associated with old-growth forests such as the northern spotted owl.

*These acres currently contribute to meeting the 15% S&G but do not provide suitable owl habitat. The remaining Federal Forest Land habitat includes younger stands that do not yet count as late-successional.

Recommendations

At this time, I **recommend** the following to meet the intent of the 15 percent retention standard and guideline and to maintain our options for meeting this S&G into the future within the Upper Hayfork Creek Watershed:

- The GIS database used for this analysis is an appropriate 'coarse grain' tool for landscape level (i.e., 5th field watershed) analyses. At the project level, individual stands proposed for treatment should be examined to determine what ecological role they are filling related to old-growth habitat.

- Consider silvicultural treatments designed to accelerate the development of old-growth habitat conditions in younger stands.
- Defer timber harvesting in 4G and 4N stands. These stands are likely the highest quality old-growth habitat and currently comprise only about two percent of the watershed. Timber harvesting may become appropriate within these stands when we can demonstrate that other younger stands are meeting the ecological roles of old-growth habitat.
- *Limited impacts to 4G and 4N stands as part of a strategy to protect current and developing old-growth from wildfire may be appropriate in strategically located areas where fire protection is a concern. Prescriptions should be designed to maintain old-growth conditions to the extent practicable.*