Aquatic Wildlife and Management Indicator Species

Affected Environment

The Sugar Pine Adaptive Management Project drains to two watersheds, Lewis Creek and Big Creek, comprised of two 6th code Hydrologic Units (HUC6s). Lewis Creek is tributary to the Fresno River, and Big Creek flows directly into the Merced River. Each of these basins is further divided into HUC7s and HUC8s. Analysis was conducted at the HUC8 scale, which ranges from 466 to 2,564 acres in the project area. For this analysis, the term 'subwatershed' is used to refer to these HUC 8s. The Analysis Area is the 12 HUC8 subwatersheds that include the treatment areas proposed under the Sugar Pine Project. Table 9 indicates stream drainage and flow regime within the aquatic analysis area based on Geographic Information Systems (GIS).

Table 1. Watershed Summaries by Stream Classification

Main Stream System(s)	Watershed (HUC 5)	Sub-watersheds (HUC 8)	Stream Miles			
			Perennial	Intermittent	Ephemeral	Total
Lewis Creek	Fresno River (1804000701)	503.0008 503.0009 503.0010 503.0011 503.0055 503.3001	16.6	11.5	112.2	140.3
Big Creek	SF Merced (1804000803)	501.5003 501.5005 501.5006 501.5007 501.5053 501.5054	17.1	13.5	90.5	121.1

The project area drainage is considered part of the Sacramento-San Joaquin zoogeographic province as described by Moyle (1976, 2002). It is not known whether salmonids are native to the two watersheds within the project boundaries. Moyle (et al. 1996, 2002) identifies much of the west slope of the Sierra Nevada range above 5,000 feet elevation as being historically fishless due to glaciation during the Pleistocene and steep topography. The fish community for the project area elevation and zoogeographic province is described by Moyle (2002) as the rainbow trout (*Oncorhynchus mykiss*) assemblage. That species is found in clear high-gradient, perennial streams at high elevations. Such habitats are characterized as having more riffle than pools, with water temperatures seldom exceeding 21 degrees Celsius (º C).

Between 1991 and 2007, primary streams and meadows were surveyed over various times and locations. Surveys have been conducted for aquatic species, stream channel characteristics, and

watershed restoration needs. Channels were defined by reach type based on observed channel gradient, width/depth ratios, channel meander, substrate material, channel stability (Pfankuch 1975), riparian zone, large woody debris and fish habitat. Channel reach types (Rosgen 1996) were determined based on observed channel attributes such as channel morphology, along with sediment and transport characteristics. Channel types are evaluated in terms of sensitivity to disturbance as presented by Rosgen (1996), which varies by channel gradient and size of substrate. Five Stream Condition Inventory (SCI) (USDA-Forest Service 2005a) plots were established along possible response or depositional channels (Montgomery and Buffington 1997) (low gradient, fine substrate) to evaluate current conditions and establish a possible baseline comparison for future monitoring. Benthic macroinvertebrates were evaluated using biotic indices from Hilsenhoff (1987) and Winget et al. (1979). Separate surveys for reptiles and amphibians (Fellers and Freel 1995) were completed in 2007.

Surveys within the aquatic analysis area have identified that rainbow and brown trout occur in all the larger perennial tributaries within the project area. These two species are collectively referred to as resident trout. Upstream fish movements are limited by areas of high channel gradient, falls, and several small dams (private property). A put-and-take fishery is maintained by the California Department of Fish and Game (CDFG) within the project area, although streams are self-sustaining. Both Lewis and Big Creek are subject to angling pressure. There are 34 miles of perennial streams occurring in the project area subwatersheds. The perennial streams are potentially habitat for resident trout, aquatic macroinvertebrates, and herpetofauna, although intermittent and ephemeral channels can serve as migration corridors for herpetofauna and also influence habitat in the perennial streams. Map 9 located in the Appendix A, Map Package, displays the perennial stream systems and subwatersheds for the Sugar Pine Adaptive Management Project area.

A number of special interest amphibian or reptile (herpetofauna) species may occur or have suitable habitat in the project area subwatersheds. The U.S. Fish and Wildlife Service (USFWS 2009) indicated that potential habitat may be present for the threatened, endangered, or candidate species: California red-legged frog (*Rana aurora draytonii*); mountain yellow-legged frog (*R. muscosa*); and Yosemite toad (*Bufo canorus*). Additionally, suitable habitat may be present for the Forest Service sensitive western pond turtle (*Clemmys marmorata*) and foothill yellow-legged frog (*R. boylii*). Potentially suitable habitat for these species would be perennial streams, meadows, and ponds. Additionally, foothill yellow-legged frog and western pond turtle may also utilize intermittent streams. Elevations less than 5000 feet may provide habitat for California red-legged frog, foothill yellow-legged frog, or western pond turtle. Elevations greater than 5000 feet may provide habitat for mountain yellow-legged frog, and meadows at elevations greater than 6000 feet could provide Yosemite toad habitat.

Existing Condition Summaries

The following tables and figures summarize information within project area HUC8 subwatersheds. Information is summarized from the Project Hydrology, Aquatics, Aquatic Species Biological Assessment/Evaluation, and Management Indicator Species reports. Table 10 indicates present stream channel conditions and overall sensitivity to disturbance.

Table 2. Summary of Subwatershed Conditions

Subwatershed	Acres	Current Channel Stability	Sensitivity to disturbance
501.5003	466	Stable	Low
501.5005	2229	Stable	Moderate
501.5006	638	Stable	Moderate
501.5007	668	Stable	Moderate
501.5053	1817	Stable	Low
501.5054	1480	Stable	Low
503.0008	945	Stable	Moderate
503.0009	2010	Stable	High
503.0010	1549	Stable	High
503.0011	645	Stable	Moderate
503.0055	2564	Stable	Low
503.3001	1381	Stable	Moderate

Table 11 displays miles of perennial streams, miles occuppied by resident trout, 2007 maximum (15-minute) summer water temperatures from the larger perennial streams, stream shading, and results from benthic macroinvertebrate sampling expressed as Hilsenhoff Biotic Index (HBI), and Biotic Condition Index (BCI) (Vinson 2008). Table 12 presents woody debris data from the project SCI plots and stream channel surveys, while Table 13 notes potential habitat for threatened, endangered, proposed or sensitive (TEPS) herpetofauna, along with Aquatic Management Indicator Species (MIS). Figure 2 displays mean daily water temperatures through the summer of 2007.

Table 3. Perennial Streams; Resident Trout Occupancy, Maximum 15-Minute Water Temperatures, Percent Stream Shading, and Indices for Benthic Macroinvertebrates

Subwatershed	Perennial (mi)	Resident Trout occupied (mi)	Max Water Temp (ºC)	Stream Shading	HB Index	BCI
501.5003	1.1	0.5	13.3	>70%	ND	ND
501.5005	4.2	3.0	ND	ND	4.14	140
501.5006	1.6	1.2	19.2	70%	4.09	85
501.5007	1.1	0.3	ND	ND	ND	ND
501.5053	4.8	4.8	19.4	70%	4.13	86
501.5054	4.3	4.3	ND	ND	ND	ND
503.0008	1.5	0.2	ND	70%	ND	ND
503.0009	3.7	3	ND	70%	ND	ND
503.0010	2.4	1.7	17	78%	4.14	82
503.0011	1.2	0	ND	84%	4.60	119
503.0055	5.4	5.4	18.3	70%	3.14	100
503.3001	2.4	1.8	ND	ND	ND	ND

(ND= No SCI data)

Table 4. Woody Debris Data

Subwatershed	Min length (m)	Mean density/100 m (d >=0.1 m)	LWD/100 m (0.3 x 3 m)
501.5003	ND	ND	ND
501.5005	ND	ND	ND
501.5006	1.1	110	7
501.5007	ND	ND	ND
501.5053	7.7	22.3	1.4
501.0054	ND	ND	ND
503.0008	3	ND	5.3
503.0009	3	ND	8.9
503.0010	1.4	167	2
503.0011	0.9	135	0.7
503.0055	3.6	140	2.5
503.3001	ND	ND	11.1

(ND= No SCI or stream survey data)

Table 5. Summary of Potential Habitat within Project Area Subwatersheds (Potential Acres Includes Marginal Acres)

Note: foothill yellow-legged frog acres are within western pond turtle habitat (overlap).

Species	Potential Habitat (ac)	Marginal (ac)
California red-legged frog	5	0
Foothill yellow-legged frog	900	590
Western pond turtle	1740	1150
Mountain yellow-legged frog	670	330
Yosemite toad	110	0
Benthic macroinverbrates	34 (mi)	0
Pacific tree frog	172	0

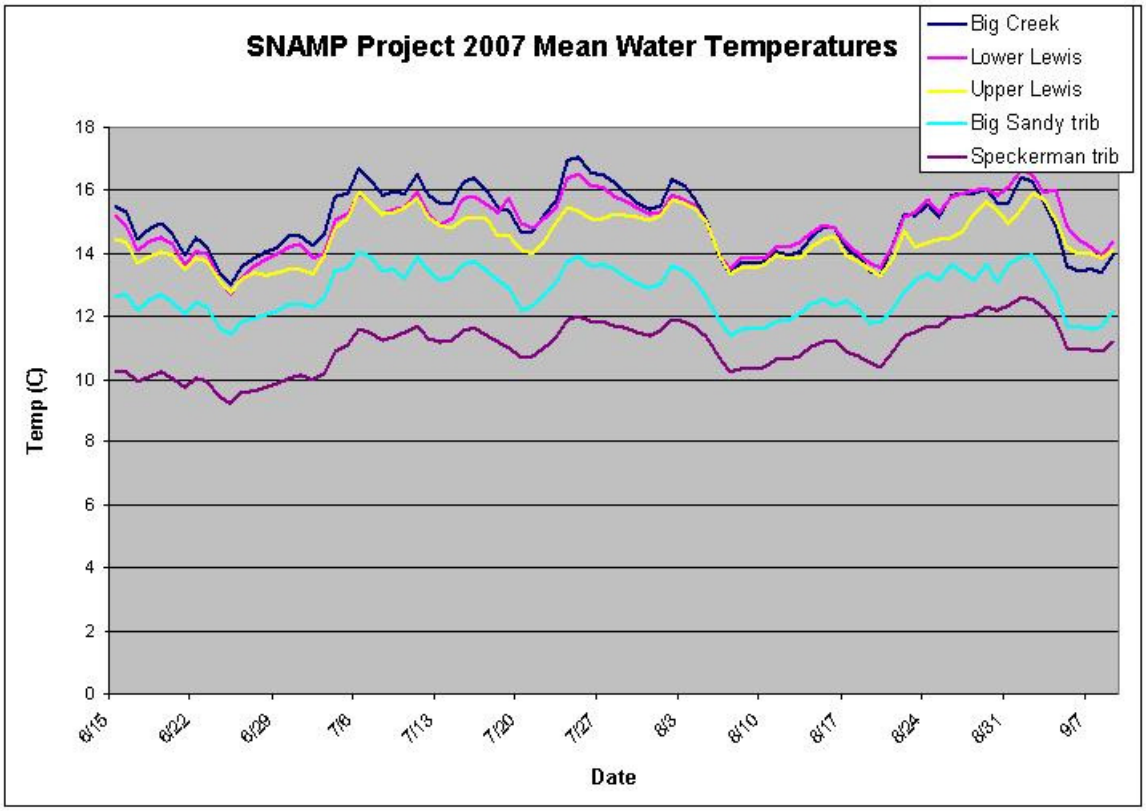

Figure 1. 2007 average summer water temperatures for project area streams

Environmental Consequences

This section analyzes the effects of the Sugar Pine Adaptive Management Project on aquatic/riparian species and their habitats. A list of past, present, and foreseeable projects for the project area is located in Chapter 3. Proposed management actions have the potential to directly alter stream shading (solar radiation); and indirectly or cumulatively alter water temperature; water quantity; water quality; sediment, nutrient, and litter inputs; woody debris; and channel structure. All of these elements can affect aquatic habitat and nutritional resources of aquatic organisms (Gregory et al. 1987; Chamberlin et al. 1991; Furniss et al. 1991; Dwire et al. 2006).

Aquatic (benthic) macroinvertebrates (a Management Indicator Species or MIS) are recognized for their importance in the aquatic/riparian systems within the project area. Thus, if the project alters stream temperature, canopy cover, hydrologic regime, sediment inputs, seeps/springs/headwater areas, and nutrient cycling (LWD or litter inputs), it could affect aquatic/riparian species indirectly through affects to the invertebrate community. Various life stages of resident trout and herpetofauna utilize benthic macroinvertebrates as a food source.

Stream flow may increase as basal area (and evapotranspiration) declines, and peak flows can be indirectly affected by vegetation removal (Chamberlin et al. 1991; Kattleman 1996). Troendle (2001) indicated increased water yields following timber harvest, although treatments were primarily clearcuts rather than thinnings that are being proposed for the Sugar Pine project. Alteration of the hydrologic regime (timing, duration or magnitude of flows) from the combined effects of silviculture and underburning could affect spawning for fish, amphibian breeding, and MIS habitat (benthic macroinvertebrates and Pacific tree frog). Such an alteration could also result in channel downcutting, bank instabilities and degradation of aquatic habitat through additional accumulations of sediment in pool habitat and covering of spawning gravels. In snow-dominated areas, such as the Sugar Pine drainage area, nearly all of the change in flows would occur during spring runoff, and spring runoff may occur slightly sooner if reductions in canopy allow faster melting of the snowpack.

Fire Effects

One of the objectives of the Sugar Pine Adaptive Management Project is to modify the intensity and spread of fire in the Wildland Urban Interface near the communities of Sugar Pine and Fish Camp. This would be accomplished using a combination of thinning and fuels reduction. Nakamura et al. (2008) noted some success with reducing crown fire after thinning and burning for the Cone and Megram Fires. They also note that some fires are so large (McNally or Cedar Fires) that would likely continue to burn through or around treatment areas.

Little is known about fire history of riparian areas in the west, but it is expected to vary from those experienced in upland areas (Dwire and Kauffman 2003; Bisson et al. 2003). Riparian areas differ from upland areas in topography, microclimate, geomorphology, and vegetation. Further they are characterized as having cooler air temperatures, lower daily maximum air temperatures, and higher relative humidity. These characteristics may contribute to higher moisture content of live and dead fuels, and riparian soils, which presumably lowers the intensity, severity and frequency of fire (Dwire and Kauffman 2003).

Fire, both prescribed and wild, has potential to affect aquatic/riparian systems. Prescribed burning could indirectly affect streambank stability, aquatic foodwebs, stream temperature, and large wood dynamics (Dwire et al. 2006; Bêche et al. 2005). High intensity fires can severely disrupt aquatic ecosystems, and that these affects can be prolonged (up to 300 years for LWD). Specific influences may include decreased channel stability; greater and more variable stream discharge;

altered woody debris delivery and storage; increased nutrient availability; higher sediment delivery and transport; and increased solar radiation and altered water temperature regime (Bisson et al. 2003; Dunham et al. 2003).

Impact of fire on the benthic macroinvertebrate community varies by burn intensity and extent; steam size and gradient; precipitation and amount of runoff; vegetative cover; geology; and topography. Some indicators of community health may return to pre-fire conditions within 1 to 2 years, but the overall community will probably vary for 5 to 10 years after the fire (Minshall 2003; Reardon et al. 2005).

The extent of fire effects on fish populations would be related to recovery of suitable water temperatures, suitable water quality, and connectivity to population refugia. Trout are noted as being resilient and adapted to disturbance (Rieman and Clayton 1997; Dunham et al. 2003; Rinne and Jacoby 2005), but recovery could take a decade or more. Sestrich (2005) reported that native trout populations recovered rapidly, with some sites exceeding pre-fire population levels within three years following fires in the Bitterroot River Basin (2000). Greswell (1999) considered the disturbance regime resulting from wildfire could facilitate invasion by nonnative fish species.

The ecological diversity of riparian corridors is maintained by natural disturbance regimes including fire and fire-related flooding, debris flows, and landslides (Dwire and Kauffman 2003). Many species have adapted life histories that are shaped by, and may depend on disturbance events (Dunham et al. 2003; Bisson et al. 2003; Rieman et al. 2005). There remains debate among Aquatic Ecologists regarding the need to treat riparian areas, and the types of treatments. Part of the controversy is related to the diverse and complex effects that fire can have on aquatic systems (Dunham et al. 2003). Researchers agree that aquatic systems have developed under a disturbance regime. Some aquatic biologists believe that wildfire poses additional risk to endangered species, while others feel affects from treatments are more likely to damage aquatic systems than fire (Erman 1996; Bisson et al. 2003). Analysis following the Angora Fire (USDA-FS 2007), identified fire spread was facilitated in part by corridors provided in the no-treatment Streamside Environmental Zones.

Desired Conditions

Desired conditions for the project area were described in the Fresno River Landscape Analysis (USDA-FS 2005a). Indicators are measures that can be used to describe the condition of aquatic/riparian ecosystems. They represent elements that might change as a result of management activities. There are two riparian vegetation indicators identified in the Landscape Analysis; canopy cover and large woody debris. While not identified in the Fresno River Landscape Analysis, water temperature will also be used as an aquatic indicator. The Sierra Nevada Ecosystem Project (SNEP) (Jennings 1996; Moyle et al. 1996; Erman 1996) notes that these aquatic indicators could be potentially be affected by the types of activities being proposed. The aquatic indicators are described in the following:

Canopy Cover

Canopy cover is the degree to which tree canopies obscure the sky or block the sun. Canopy cover was measured as the percentage of stream shading and varies by the width of the stream channel, which is generally a function of stream order. Stream shading is important in maintaining water temperature with the effect varying by the height of adjacent vegetation, proximity to the stream, topography, angle of the sun, and aspect (Beschta et al. 1987; USGS 1997, 2002; Moore et al. 2005). The Fresno River Landscape Analysis (USDA Forest Service 2005a) identifies stream shading of 70 to 80% within the riparian zone as a desired condition.

Large Woody Debris

Large woody debris (LWD) is of both physical and biological importance within stream channels and riparian zones (Bisson et al. 1987; Sedell et al. 1988). LWD provide sediment traps, affect stream channel morphology to create pool habitat, increase channel roughness to dissipate energy, provide complexity to habitat, provide structural cover, and provide nutrient inputs (Bisson et al. 1987). LWD provide cover for fish and animal species, are directly consumed by specialized macroinvertebrates. Factors influencing LWD in the Sierra Nevada mountain range may include geomorphology, decay resistance of local species, floods and past management (Ruediger and Ward 1996). The desired condition from the Fresno River Landscape Analysis is that project streams should average (over the watershed) between 3 to 15 LWD/100 m of the larger (stable) class.

Water Temperature

Water temperature has multiple effects on aquatic/riparian species and their behavior. Thermal effects relate to directing behavior (trigger migration or spawning); controlling factors (time of incubation and emergence); lethal (lead to breakdown of homeostatic system and increased susceptibility to disease); and growth (metabolic regulation; affected by food supply) (Beschta et al. 1987; Armour 1988; USGS 1997; 2002; Sauter et al. 2001). Elevation, aspect, stream width, channel roughness coefficient, riparian shading, solar radiation, air temperature, cloud cover, and stream discharge levels can affect water temperature. Of these elements, direct effects on riparian shading and indirect effects on stream discharge level could have the most effect on stream temperature (Beschta et al. 1987; Moore et al. 2005). A desired condition for water temperature was not identified in the Fresno River Landscape Analysis. The CDFG discontinues trout stocking if water temperatures exceed 21° C (CDFG 2009), thus the Desired Condition for this analysis is that water temperatures be less than 21° C. This temperature is also consistent with that described by Moyle (1976; 2002) within the rainbow trout assemblage.

Alternative 1 – No Action

Under the No Action alternative, current management plans would continue to guide activities in the project area. This includes all ongoing activities with existing decisions or permits that would not be changed if this alternative were selected including: underburning, plantation maintenance, cattle grazing, recreation, and recreation residences. No treatments would be implemented in any subwatershed as displayed in Table 14.

Table 6. Sugar Pine Adaptive Management Activities Proposed under Alternative 1 by Subwatershed

Subwatershed	501.5003	501.5005	501.5006	501.5007	501.5053	501.5054	503.0008	503.0009	503.001	503.0011	503.0055	503.3001	Total
Commercial or pre-commercial thinning or tractor piling	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Precommercial Thin	0	0	0	0	0	0	0	0	0	0	0	0	
Mastication	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Underburn	0	0	0	0	0	0	0	0	0	0	0	0	**0**
No Treatments	466	2229	638	668	1817	1480	945	2010	1549	645	2564	1381	**16392**
Subwatershed Acres	466	2229	638	668	1817	1480	945	2010	1549	645	2564	1381	**16392**

The No Action Alternative would not implement the Sugar Pine Adaptive Management Project to reduce fire ladder conditions or stand densities (thinning); pile slash for burning; burn slash piles; masticate and/and or precommercially thin stands; plant trees; reduce fuel loading through controlled burning; construct handline around jackpot burn areas; manually remove noxious weeds, or construct and reconstruct roads. Potentially affected habitat for aquatic threatened, endangered, sensitive and MIS species is displayed in Table 15. Indicators for aquatic/riparian habitat and species are canopy cover, water temperature, and large woody debris.

Direct Effects

Canopy Cover

No commercial timber removal or underburning would occur under this alternative. No direct, indirect, or cumulative affects to riparian canopy cover (current stream shading > 70%) are anticipated from Alternative 1. There would be no direct effects on TES aquatic species or their habitat. Stream shading would meet the desired condition of > 70 to 80%.

Water Temperature

There would be no anticipated direct effect on water temperature as a result of the Alternative 1.

Large Woody Debris

There are no activities proposed under Alternative 1. There would be no direct effects on LWD recruitment.

Indirect Effects

Canopy Cover

No indirect effects on canopy cover from stand density alteration or fuel treatment would occur under Alternative 1. Pilliod et al. (2003) suggest that no action may have consequences for amphibians due to overgrown forests changing the quality of amphibian habitat and increasing susceptibility for a high severity fire.

Water Temperature

Water temperature data collected from the project area in 2007 indicate project area streams are within the desired condition and within the range for resident trout species.

It is anticipated that Alternative 1 would maintain water temperatures within the desired condition (< 21° C) and no indirect affects would be anticipated.

Indirect and Cumulative Effects on Large Woody Debris

There are no anticipated indirect or cumulative effects on LWD from the No Action Alternative. LWD would remain lower than desired within subwatersheds 501.5053, 503.0010, 503.0011, and 503.0055. Several other subwatersheds have no LWD data and may also be less than desired.

Cumulative Effects

Past, present, and reasonably foreseeable actions within the project areas are displayed in Chapter 3 on page 25. Under Alternative 1, the Sugar Pine Project would not be implemented. Within the project area, other known activities are off-highway vehicle use, fuels, culture, and timber projects (past Federal and activities on private property), cattle grazing, road and road maintenance, and recreational use (both developed and undeveloped). Of the actions evaluated

within the analysis area, timber harvesting on private land and cattle grazing have the greatest potential to alter aquatic habitat.

Timber harvesting on private land requires a Timber Harvest Plan (THP) that evaluates compliance with State and Federal rules and laws (CDF 2005). The THP includes a cumulative effects analysis that considers effects on water temperatures, stream shading, and measures to reduce sediment movement. Most of the Forest Service actions over the past decade, along with those proposed in the next decade, relate to fuels reduction or forest thinning. These actions have Best Management Practices (BMPs) (USDA-FS 1983, 2002), along with Forest standards and guidelines to restrict off-site erosion and activities within Streamside Management Zones (SMZs). Stream channels would be expected to remain stable, with some sites of localized instability. LWD would remain below desired in subwatersheds 501.0053, 503.0010, 503.0011, and 503.0055. Approximately 0.8 miles of road cross wet meadows, representing impacts to roughly 2 acres (18 foot road template) of wet meadow habitat

The project area is primarily within the Soquel grazing allotment. Most of the primary and secondary grazing areas occur in subwatersheds 501.5005, 501.5006, and 501.5007. Proper Functioning Condition (USDI-BLM 1995) was conducted at Boggy and Soquel Meadows within the allotment in 2007. Both sites were at Properly Functioning Condition. It is expected that cattle grazing will locally result in exposed streambanks and erosion.

The Cumulative Watershed Effects Analysis (CWEA) prepared for this project (Gallegos 2009) includes consideration of actions on private lands in addition to Forest Service permitted actions. The Project CWEA does not indicate that a cumulative effect to watersheds would be expected from Alternative 1. However, it does note that subwatersheds 501.5053 and 503.0055 would remain above the lower bound threshold of concern (TOC). The bounds are guidelines developed to indicate risk of cumulative effects, and to identify areas for field review. The stream channel within subwatershed 503.0055 is the main stem of Lewis Creek. The creek through this subwatershed is primarily high gradient, with a bedrock and boulder substrate, thus has limited probability of stream channel instabilities developing. Observations of the water temperatures were recorded from Lewis Creek (within subwatershed 503.0055) during the summer of 2007. Water temperatures never exceeded 18.3° C (15 minute step) or had a daily average greater than 16.6° C. It does not appear that current upstream uses are negatively affecting conditions within the subwatershed. Benthic macroinvertebrate sample data indicates water quality presently is in good condition within this subwatershed.

Table 7. Summary from analyses for aquatic Threatened (T), Endangered (E), Sensitive (S) and Management Indicator Species (MIS) for effects from Alternative 1

Species (status)	Potential Habitat (ac)	Marginal (ac)	Potential Habitat in Treatment Area (ac)	Marginal Habitat in Treatment Area (ac)	Determination
California red-legged frog (T)	5	0	0	0	No effect
Foothill yellow-legged frog (S)	900	590	0	0	No effect
Western pond turtle (S)	1740	1150	0	0	No effect
Mountain yellow-legged frog (S)	670	330	0	0	No effect
Yosemite toad (S)	110	0	0	0	No effect
Benthic macroinvertebrate habitat (MIS)	34 mi.	0	0	0	Stable
Pacific tree frog habitat (MIS)	170	0	0	0	Stable

Source: Strand 2009, Strand 2009a

Alternative 2 – Proposed Action

Under Alternative 2, the development of Strategically Placed Area Treatments (SPLATs) would occur. Additional areas would be treated to provide a defensible fuels profile near key transportation corridors and within the defense zone of the wildland urban intermix. In addition to those treatments needed to meet fire and fuels objectives treatments would be created to reduce stand densities (basal area) to such a level as to improve the growth and vigor of remaining trees. Treatments included in this alternative are: thinning from below in conifer stands, either pre-commercially, commercially, biomassing and/or mastication to reduce lower and mid-level canopy stand densities; mastication of brush and shrub patches; prescribed burning, both understory and piles; manual reduction and/or prescribed burning of noxious weed infestations; and prepare and plant failed conifer plantations. Proposed treatments by subwatershed are displayed in Table 16.

Table 17 displays herpetofauna and MIS habitat potentially affected by the Proposed Action.

Table 8. Activities Proposed within Project Area Subwatersheds under Alternative 2

Subwatershed	501.5003	501.5005	501.5006	501.5007	501.5053	501.5054	503.0008	503.0009	503.0010	503.0011	503.0055	503.3001	Total
Commercial/pre-commercial thinning or tractor piling	0	5	194	132	124	11	297	323	627	33	162		**1908**
Mastication	19	8	79	0	34	18	110	294	3	139	80	14	**797**
Underburn	0	9	15	0	21	22	15	113	22	0	0		**215**
No Treatments	447	2207	352	536	1638	1429	524	1280	897	473	2322	1367	**13472**
Subwatershed Acres	466	2229	638	668	1817	1480	945	2010	1549	645	2564	1381	**16392**
% Subwatershed treated	4%	1%	45%	20%	10%	4%	45%	35%	42%	27%	9%	1%	**18%**

Table 9. Overlap of Proposed Treatment Areas and Potential Habitat for species

CRLF acreage represent suitable breeding habitat (most acres evaluated under the site assessment did not represent suitable breeding during site review.) RABO acres are within WPT habitat (overlap). Marginal acres are included in Potential Habitat acres. No treatment zones are core areas along perennial streams (50 ft) and intermittent streams (25 ft) that would have no activity.

Species	Potential Habitat (ac)	Marginal (ac)	Potential Habitat in Treatment Area (ac)	Marginal Habitat in Treatment Area (ac)	No Treatment Zones (ac)
California red-legged frog (CRLF)	5	0	0	0	0
Foothill yellow-legged frog (RABO)	900	590	320	230	90
Western pond turtle (WPT)	1740	1150	630	440	90
Mountain yellow-legged frog (RAMU)	670	330	90	50	28
Yosemite toad (BUCA)	110	0	30	0	2
Benthic Macroinvertebrates (MIS)	34 mi	0	8 mi	0	8 mi
Pacific tree frog (MIS)	170	0	7 ac	0	7 ac

Commercial or pre-commercial thinning, along with tractor piling, would occur over 1900 acres (gross treatment area) under the Proposed Action. The actual area treated would be less considering SMZs, Old Forest Linkage corridors, controlled areas, aggregations within treatment areas not requiring treatment to achieve project objectives, and access limitations due to topography. Commercial thinning would occur over approximately 850 acres under the Proposed Action. Underburning is proposed over approximately 215 acres (<2 % of the project area). Within the 34 miles of perennial stream channel, approximately 7.6 miles are either within or bordered by a proposed treatment unit. Additionally, approximately 7 acres of wet meadow are within or adjacent to proposed treatment units. Project implementation would incorporate Best Management Practices (BMPs). BMPs (USDA-Forest Service 1983; 2002) were developed to reduce erosion and off-site transport of sediment to stream channels. BMPs implemented with this project are detailed under Project Design Criteria and were identified in the project Hydrology Report (Kaplan-Henry and Stone 2008). Literature indicates that BMPs are effective in minimizing the erosion in harvest units and at preventing sediment from reaching streams. In a study of sediment redistribution after harvesting, Wallbrink and Croke (2002) found that sediment eroded from skid trails was deposited in the harvest unit and the 23 to 30 m wide stream buffers. MacDonald and Stednick (2003) note that forest harvest and fuels treatments should have little effect on water quality if they are well-planned and BMPs are implemented. Monitoring of BMP on Forest Service lands in California has shown that, when implemented, timber management BMP are 95 to 98% effective (USDA-FS 2004a).

Aquatic habitat indicators are canopy cover, water temperature, and large woody debris.

Direct Effects

The 5 acres of potential habitat for California red-legged frog are the private ponds in the Sugar Pine and Fish Camp areas, which are not part of this project. Potential effects on foothill yellow-legged frog (RABO), western pond turtle (WPT), mountain yellow-legged frog (RAMU), or Yosemite toad (BUCA) could occur from crushing of individual animals by tractor thinning, tractor piling, or mastication, or from burning of animals. Most direct effects would not be expected to occur due herpetofauna primarily occupying riparian areas where proposed treatments are limited. During primary periods of project operations (May through Sept) it is expected that frogs and turtles would remain within the riparian areas due to presence of water, the microclimate provided, and riparian connectivity, except during rainy periods. The possibility of direct effects from crushing would be most likely in October when species leave streamside areas for overwintering sites or during rainy periods when species may move beyond riparian areas. Operation of heavy equipment ceases during periods of prolonged precipitation to prevent compaction.

Introduced fire could directly affect herpetofauna. Some species may use slash piles for cover or for estivation. The possibility of direct effects on individual animals from burning piles within the Old Forest Linkage Corridors would be reduced by implementing the project design measure to light piles on one side to allow an escape from the pile. Underburning may also represent a direct effect to herpetofauna. Underburning is proposed adjacent to perennial streams in units RX 1, 3, and 5. RX units 3 and 5 represent approximately 7 acres of RABO and 13 acres of WPT habitat. RX 3 contains approximately 5 acres of RAMU habitat. All of these potentially effected habitats were considered marginal due to dense canopy cover, but could serve as dispersal corridors. Prescribed burning would be expected to occur during the spring or fall. During spring, amphibians may be moving to breeding sites or dispersing after breeding. During the fall, herpetofauna may be moving to overwintering sites or estivating within areas to be burned. Allowing fire to creep into the SMZ (as opposed to active introduction) would provide

opportunity for herpetofauna to move away from areas burning, but not eliminate the possibility of mortality.

Direct effects to listed herpetofauna would not be anticipated from implementing the Proposed Action due to project design measures; non-detection of listed species during surveys; and no records of these species occurring within the project area subwatersheds.

Canopy Cover

Current levels of stream shading for project area perennial streams are presented in Table 9. These levels are currently within the desired condition of 70 to 80%. Naiman et al. (2000) note that riparian forests strongly influence stream microclimate; including air, soil, and surface temperatures; relative humidity; and solar radiation. Proposed commercial thinning and underburning have the potential to directly affect canopy cover or stream shading. If canopy altering treatments occurred in streamside areas there could be an increase solar radiation to the stream channel.

Streamside shading affects the amount of solar radiation that filters to the surface of the water. During late summer, solar radiation potential is greatest, air temperatures are warmest, and stream flows are lowest. Only perennial channels flow are expected to flow during this period, thus concerns over water temperature focus on these stream channels. Perennials also comprise the potential habitat for resident trout, benthic macroinvertebrates, and herpetofauna. Base flows may be augmented by the reduction in vegetation (an indirect effect), but no effect is expected within the stream channels (Kaplan-Henry and Stone 2008). Possible increases in soil moisture would be utilized by the remaining vegetation, so it would not likely be available for stream flow.

Benthic macroinvertebrates serve as food source for various lifestages of fish and herpetofauna. Kattleman (1996) notes several studies have demonstrated that communities of aquatic invertebrates changed significantly in response to upstream logging, with some of these effects persisting for two decades. Much of the food base for stream ecosystems is derived from adjacent terrestrial ecosystems with litter fall from deciduous stands exceeding that of coniferous stands. Deciduous input (leaves) generally breaks down in less than half the time necessary for the breakdown of coniferous input (needles; Gregory et al. 1991). Buffer strips 30 m (98.4 feet) wide are noted as protecting invertebrate communities from logging induced changes (Gregory et al. 1987; EPA 1991).

Dwire et al. (2006) suggest that prescribed fire may top-kill some riparian trees and shrubs. A study at Blodgett Forest in northern California introduced prescribed fire into the riparian zone and found that a 4.4% mortality rate resulted, occurring in trees 11 to 40 centimeters (4.5 to 15.7 inches) dbh (diameter at breast height; Bêche et al. 2005). Prescribed fire is not proposed for introduction into the perennial SMZs for this project, but it would be allowed to creep within the SMZ.

Perennial stream channels, which represent the potential habitat for aquatic/riparian species, would have Class I SMZs. Class I SMZs are a minimum of 100 feet from each streambank, with widths adjusted for slope as presented under project design criteria. Class I SMZs are within the Old Forest Linkage corridors. These corridors extend 150 feet from both streambanks along the perennial streams within the project area. There are no proposed treatments within the inner 50 feet from each streambank. The outer 50 feet would implement hand treatments to remove the understory ladder fuels. No alteration of the existing stream shading (> 70%) would be anticipated from the Proposed Action.

Water Temperature

As measured during the summer of 2007 (displayed in Figure 2), daily mean water temperatures in the project area were less than 21° C (desired condition). The maximum water temperatures (15 minute data) during the 2007 monitoring period are presented in Table 9. No maximum water temperatures recorded during 2007 exceeded the desired condition. There are no anticipated alterations to canopy cover, thus there would be no direct effects on water temperature anticipated from the Proposed Action.

Large Woody Debris

Table 4 indicates that subwatersheds 501.5053; 503.0010; 503.0011; and 503.0055 are lower than Desired Condition for large woody debris. Other subwatersheds lacking LWD data may also be less than desired. This condition is likely a result of historic logging that occurred throughout the project area, including riparian areas. Naiman et al. (2000) project that 80% of LWD has a stream channel residence of less than 50 years. Trees are now of sufficient size and are large enough, in combination with individual mortality, to provide additional input. The element within the SMZs that represents the most immediate source of LWD is snags. There is no proposed removal of snags within the first 50 feet from the perennial stream channel within the Old Forest Linkage corridors. Beyond 50 feet snags may be removed if they contribute to ladder conditions (generally 10 to 50 ft high). Some snags to be removed may have contributed to LWD recruitment.

Indirect Effects

Thinning to reduce ladder fuels would occur on over 800 acres under this alternative. Underburning is proposed over approximately 215 acres, and mastication on 800 acres. Table 17 identifies that perennial streams adjacent to treatment areas represent approximately 320 acres of foothill yellow-legged frog; 630 acres western pond turtle; 90 acres mountain yellow-legged frog; and 30 acres of Yosemite toad habitat, 8 miles of benthic macroinvertebrates, and 7 acres of Pacific tree frog habitat. The foothill yellow-legged frog habitat acreage is within western pond turtle habitat (overlap). Within the foothill yellow-legged frog and turtle habitat are 90 acres that would have no treatments (corridors along perennial and intermittent streams). Similarly, 30 acres of mountain yellow-legged frog habitat occurs along no treatment corridors. The perennial streams and wet meadows (MIS habitats) are also buffered by no treatment areas. The Proposed Action has a risk of compacting soil (tractor thinning, mastication, new road construction, and machine piling or slash), which could result in both short and long-term sediment delivery to riparian and aquatic habitats. Reduction in stand densities could affect canopy cover (indirectly affecting micro-climate and water temperatures), availability of large woody debris; macroinvertebrate community, and changes to water yield (indirectly affecting stream channel stability). Alterations to habitat complexity, air temperature, decreased soil moisture or relative humidity within areas adjacent to perennial streams could influence herpetofauna.

Canopy Cover

Indirect effects on canopy cover (stream shading) could occur if the Proposed Action results in an alteration to the hydrologic regime. Such alteration could be expressed in bank and channel instabilities, widening of the stream channel, and undermining of bank trees. The widening of the stream channel would increase the level of reduced canopy cover over the stream (less stream shading). Unit T-11 is proposed adjacent to a segment of stream channel that is currently has poor channel stability, within a subwatershed (503.0010) that is considered sensitive to disturbance. Project design criteria have been developed to protect the channel from further degradation, and indirect effects would not be anticipated.

Effects to canopy cover would be similar to direct effects. Alterations to habitat complexity, air temperature, decreased soil moisture or relative humidity within areas adjacent to perennial streams could influence herpetofauna.

Water temperature

Solar radiation through forest canopies depends on the heights of the crowns and density, along with the foliage (Moore et al. 2005). In evaluating possible project direct effects to canopy cover it was noted that large changes in overhead canopy from stands adjacent to perennial streams would not be anticipated. Stream shading would meet the desired condition of > 70 to 80%. However, in addition to direct solar radiation, Beschta et al. (1987) addresses possible affects from angular solar radiation and describes how canopy cover can be evaluated as angular canopy density. In the outer 50 feet of treated Old Forest Linkage (riparian corridors) there is a possible increase of open space within the understory component of the treated stand. This provides an opportunity for increased angular solar radiation. It is anticipated that the majority of the trees would be retained and the inner 50-foot no treatment zone would intercept angular solar radiation. Wilkerson et al. (2006) found that a 23 m (75 feet) buffer resulted in no change to water temperature, while a 11 m buffer (>60% canopy retention) resulted in an increased weekly maxima of 1.0 to 1.4° C. There would be no anticipated indirect change to water temperatures.

Some underburning would take place through within Old Forest Linkage corridors. When this occurs there are design measures that allow for creeping into the SMZ, but not for active introduction of fire. It is expected underburning would occur within the 100-foot zone and some understory trees could be killed as a result. It is not expected that overstory trees contributing to stream shading and blocking solar radiation would be killed by the underburning proposed under the Sugar Pine Adaptive Management Project.

Changes in stream discharge level could be potentially affected by the proposal. Altered stream discharge would be an indirect effect from the proposal, since basal area (and evapotranspiration) decline due to changes in stand density (Chamberlin et al. 1991; Kattelman 1996). If more water were available as baseflow during the late summer, there would be a possible reduction in stream temperature. Researchers have concluded that if less than 10% of the basal area is removed, there is little impact on flows (Troendle et al. 2006). Removal of between 10 and 20% of basal area may affect flow, but the change is not detectable due to the natural variability of flow. Other investigators found that approximately 20% of the basal area must be removed before a statistical change in flow is detected (Troendle et al. 2006). MacDonald and Stednick (2003) report that 15% basal area must be removed before a change in flow can be detected in small research watersheds, and detection becomes more difficult as watershed size increases. Huff et al. (2002) modeled water yield for similar treatments (thinning) in the Feather and Yuba River basins, estimating an increase of 0.3% in water yield. However, individual areas could have higher water yields within the range of variability estimated.

The Sugar Pine Adaptive Management Project Hydrology Report (Kaplan-Henry and Stone 2008) considered anticipated changes to hydrologic regime. The Project Hydrology Report notes that base flows may be augmented by the reduction in vegetation, but the effect is not likely to persist into the dry summer season where it would be detectable. The increase in soil moisture would be utilized by the remaining vegetation, so it would not be available for stream flow. Thinning trees is not expected to have much effect on hydrologic regime. It is anticipated that project design measures for Alternative 2 would maintain water temperatures within the current and desired condition (< 21° C), within the project area.

Large Woody Debris

Of the treatments that would be implemented under the Proposed Action, delivery of large woody debris could be affected by reduction in stand density through commercial harvest or underburning. It has been identified that stream channels within subwatersheds 501.0053; 503.00010; 503.0010; and 503.0055 are below desired condition for LWD. There are approximately 200 miles of stream channels within project area subwatersheds. However, this evaluation focuses the perennial and intermittent stream channels (approximately 60 miles) within project area subwatersheds. Perennial channels have Class I SMZs and are within the Old Forest Linkage corridors. However, intermittent channels (Class II SMZs) contribute water over half of the year and may be important for herpetofauna dispersal. Additionally, intermittent channels may have sufficient flow to transport smaller pieces of LWD, thus influence LWD in the perennial channels. The ephemeral channels are more likely to retain LWD rather than transport it due to limited channel capacity.

Modeling LWD recruitment has been challenging considering that tree fall patterns may be chronic or episodic and influenced by geomorphology; tree or snag angle; bank steepness; prevailing wind direction; fragmentation; decomposition; mortality rates; and stem failure (Van Sickle and Gregory 1990; Bragg et al. 2000; Bragg and Kershner 2002, 2004; Mellen and Ager 2002; Meleason et al. 2002). The models attempt to address direction of tree fall and assign probability to angle of fall or assume angle is random. The random scenario could occur if tree failure is not influenced by disturbance or geomorphology. However, Naiman et al. (2000) suggest the probability of fall direction is strongly influenced by local topography, thus trees are more likely to fall toward the channel than other directions. It appears the more mature and intact the adjacent riparian forest is, the greater the likelihood of sustained LWD recruitment (Bragg et al. 2000).

McDade et al. (1990) indicated that 70% of LWD originated within ½ stand height (20 m in that study) of the stream channel and approximately 85% of LWD would have been provided within a 30 meter (98.4 ft) buffer. Meleason et al. (2002) noted that 90% of woody inputs were found to originate within 26 meter (85 ft) for mature conifer stands. To maintain LWD recruitment, the SMZs should be between 0.75 and 1.0 tree heights. The basic premise presented by Robison and Beschta (1990) is that the probability of LWD entering a stream by direct fall is zero when the distance exceeds the tree height.

The perennial streams have Class I SMZs and are within the Old Forest Linkage (riparian corridors). There are 34 miles of perennial streams in the aquatics analysis area. Approximately 7.7 miles of stream are adjacent to or within a treatment area. The Old Forest Linkage corridors have a 50-foot no treatment buffer on the inner 50 feet of the stream channel. The remaining outer 50-feet excludes heavy mechanical equipment, but understory trees could be removed to reduce fire ladder conditions. There is no proposed removal of snags within the first 50 feet from the perennial stream channel within the Old Forest Linkage corridors. Beyond 50 feet snags may be removed if they contribute to ladder conditions (generally 10 to 50 ft high). Some of these snags may have contributed to LWD.

Class II (intermittent channels) are not likely to have flow during late summer. Class II SMZs are 75 feet (each side), and exclude heavy equipment. There are 25 miles of intermittent streams in the aquatics analysis area. Approximately 8.7 miles of stream are adjacent to or within a treatment area. When project treatments are to occur within Class II SMZs, it is primarily removal of suppressed and intermediate trees contributing to ladder fuels. It is anticipated that commercial thinning could be implemented within 25 feet of the stream. Robison and Beschta (1990) discuss the concept of effective height of the tree, which is the height to the minimum

diameter and length necessary to qualify as LWD. If a diameter of 10 cm (4 inches) is applied, the top 10 feet of the tree would not meet the LWD criteria. Thus, it is more probable that 35 feet is the minimum height that might have a probability of contributing LWD to a stream channel. These trees have potential to reach the stream channel if the occur in the band between 25 and 50 feet from the stream channel and it is probable that some would have contributed to LWD.

Underburning proposed in Rx Units 1 and 3 would take place within Class I/II SMZs. When this occurs there are design measures that allow for creeping into the SMZ, but not active introduction of fire. Dwire et al. (2006) speculate that fuels reduction could potentially directly and indirectly affect aquatic/riparian habitat by altering the recruitment of LWD. They further note that prescribed fire would not necessarily remove LWD from riparian areas, and that mortality resulting from prescribed fire would likely contribute LWD to aquatic systems. In a limited (60 acre) study of active burning within the riparian zone, Bêche et al. (2005) noted a loss of 4.4% of trees, with mortally occurring between 11 to 40 cm (4.5 to 15.7 in) dbh. In that study several snags fell after being burned, but no overall increase in the amount or movement of LWD relative to unburned control sites. These effects were similar to those theorized by Dwire and Kauffman (2003) that moister, cooler microclimates within riparian areas likely contribute higher moisture content in fuels and soils, which could lower the intensity and severity of burns. Skinner (2002) also noted that fire often consumes material in the advanced stages of decay, but also creates snags and downed logs. It is expected underburning would creep within the SMZs and some understory trees could be killed a result and possibly contribute to LWD.

Limited indirect negative effects to LWD recruitment would be anticipated as a result of implementing the Proposed Action, primarily contribution from intermittent stream segments. It is expected that LWD would remain lower than desired condition within subwatersheds 501.0053; 503.0010; 503.0011; and 503.0055 for several decades. Several other subwatersheds did not have LWD data and may also be less than desired.

Cumulative Effects

Past, present, and reasonably foreseeable actions within the project areas are displayed in Chapter 3 on page 25. For the Sugar Pine Project Area, other known activities are off-highway vehicle use; fuel, culture, and timber projects (including activities on private property); cattle grazing, road maintenance; and recreational use (both developed and undeveloped). Of the actions elevated within the analysis area, timber harvesting, (including that occurring on private lands), and cattle grazing have the greatest potential to alter aquatic habitat.

Of the actions evaluated within the analysis area, timber harvesting, including that occurring on private lands, has the greatest potential to alter aquatic habitat. Effects from timber harvesting on private land would be similar to those discussed under Alternative 1. For actions considered under Alternative 2, changes to microclimate could affect air temperature, which is one of the components affecting water temperature and quality of habitat for herpetofauna. No treatments would occur within the inner 50 feet of a Class I SMZ. When timber removal occurs in SMZs, it would be primarily from suppressed and intermediate trees that are creating fuel ladder conditions. It is not expected that overhead canopy reductions would result in large changes in solar radiation or air temperature. It is anticipated that water temperatures within the project area would be maintained within the desired condition (< 21º C) under the Proposed Action. The combination of the Federal and private timber removal is not expected to cumulatively effect LWD recruitment, which would remain lower than desired, within subwatersheds 501.0053, 503.0010, 503.0011, and 503.0055. Several other subwatersheds did not have LWD data and may also be less than desired.

The CWEA prepared for this project (Gallegos 2009) includes consideration of actions on private lands in addition to Forest Service permitted actions. The lower bound threshold of concern (TOC) in subwatersheds 501.5053 and 503.0055 are currently exceeded. Additionally, subwatersheds 501.5006, 501.5007 and 503.0010 would exceed their lower TOC as a result of implementing the proposed action. Upper bound TOC would not be exceeded if Alternative 2 were implemented. Upper and lower bounds are guidelines developed to indicate risk of cumulative effects, and to identify areas for field review. The probable result from a cumulative effect would be an increase in sediment, which would negatively affect aquatic habitat. The stream channel within subwatershed 503.0055 is the main stem of Lewis Creek. The creek through this subwatershed is primarily high gradient with a bedrock and boulder substrate, thus has limited probability of stream channel instabilities developing. Further buffering the subwatershed from sediment effects is the lower pond at Sugar Pine. The pond is not within subwatershed 503.0055, but functions as a settling basin for any sediment generated upstream of the site. The effect of the pond decreases the amount of sediment in the system, further reducing the probability of a cumulative effect in the downstream subwatershed. A cumulative watershed effect would not be anticipated from Alternative 2 (Gallegos 2008). Stream channels would be expected to remain overall stable, with some sites of localized instability. Habitat for benthic macroinvertebrates (34 miles) and Pacific tree frog (170 acres) would be expected to be stable.

The project area is primarily within the Soquel grazing allotment. Most of the primary and secondary grazing areas occur in subwatersheds 501.5005, 501.5006, and 501.5007. Proper Functioning Condition (USDI-BLM 1995) was conducted at Boggy and Soquel Meadows within the allotment in 2007. Both sites were at Properly Functioning Condition. It is expected that cattle grazing will locally result in exposed streambanks and erosion. The majority of the primary use areas are within subwatersheds that drain to North Fork Willow Creek, rather than the Fresno or Merced Rivers.

Table 20 summarizes anticipated effects from the action alternatives (Alternatives 2, 3, and 4) on aquatic threatened (T), endangered (E), sensitive (S) species, along with habitat for management indicator species (MIS).

Alternative 3

Under Alternative 3, all treatment areas would be carried forward from Alternative 2, but in areas where there are known Pacific Fisher den sites, treatments within associated den site buffer would include only those treatments needed to achieve fire and fuels objectives (treatment of surface and ladder fuels). All other treatment areas would continue to treat for both fire/fuels and forest health (stand density) objectives. Gross acres of proposed treatments by subwatershed are displayed in Table 8. The actual area treated is expected to be less (approximately 85%) similar to Alternative 2.

Table 10. Activities Proposed within Project Area Subwatersheds under Alternative 3

HUC8 Subwatershed	501.5003	501.5005	501.5006	501.5007	501.5053	501.5054	503.0008	503.0009	503.0010	503.0011	503.0055	503.3001	Total
Commercial/pre-commercial thinning or tractor piling	0	5	194	132	124	11	119	181	627	33	99	0	**1525**
Lower canopy treatment/pre-commercial thinning or tractor piling	0	0	0	0	0	0	178	142	0	0	63	0	**383**
Mastication	19	8	79	0	34	18	110	294	3	138	80	14	**797**
Underburn	0	9	13	0	21	22	15	113	22	0	0		**215**
No Treatments	447	2207	352	536	1639	1429	523	1280	897	474	2322	1367	**13473**
Subwatershed Acres	466	2229	638	668	1817	1480	945	2010	1549	645	2564	1381	**16392**
% Subwatershed treated	4%	1%	45%	20%	10%	3%	45%	36%	42%	27%	9%	1%	**18%**

Direct Effects

Similar to Alternative 2, there could be potential direct effects from crushing of RABO, WPT, RAMU, or BUCA by tractor thinning, tractor piling, or mastication, or from burning of animals. The 5 acres of potential habitat for CRLF are the private ponds in the Sugar Pine and Fish Camp areas, which are not part of this project.

Also similar to Alternative 2, direct effects would not be expected to occur due herpetofauna primarily occupying riparian areas where proposed treatments are limited. Project design measures include the Old Forest Linkage corridors for Pacific fisher. These migration corridors extend 150 feet from both streambanks along the perennial streams within the project area. There are no proposed treatments within the inner 50 feet from each streambank. The outer 50 feet would implement hand treatments to remove the understory ladder fuels. No heavy equipment would be allowed within 100 feet of the streambank within these corridors. During primary periods of project operations (May through Sept) it is expected frogs and turtles would remain within the riparian areas due to presence of water; the microclimate provided; and riparian connectivity, except during rainy periods. The possibility of direct effects from crushing would be most likely in October when species leave streamside areas for overwintering sites, or during rainy periods when species may move beyond riparian areas. Operation of heavy equipment ceases during periods of prolonged precipitation to prevent compaction.

Introduced fire could directly affect herpetofauna similar to Alternative 2. Allowing fire to creep into the SMZ (as opposed to active introduction) would provide opportunity for herpetofauna to move away from areas burning, but not eliminate the possibility of mortality.

Direct effects to listed herpetofauna would not be anticipated from implementing Alternative 3 due to project design measures; non-detection of listed species during surveys; and no records of these species occurring within the project area subwatersheds.

Indirect Effects

Thinning to reduce ladder fuels would occur over approximately 760 acres under Alternative 3, 90 acres less than Alternative 2. Underburning is proposed over approximately 215 acres, and mastication on 800 acres. Table 17 identifies that perennial streams adjacent to treatment areas represent approximately 320 acres of foothill yellow-legged frog; 630 acres western pond turtle; 90 acres mountain yellow-legged frog; 30 acres of Yosemite toad; 8 miles of benthic macroinvertebrates, and 7 acres of Pacific tree frog habitat. The RABO habitat acreage is within WPT habitat (overlap). Within the RABO and WPT habitat are 90 acres that would have no treatments (corridors along perennial and intermittent streams). Similarly, 30 acres of RAMU habitat occurs along no treatment corridors. Effects from compaction and stand density would be similar to Alternative 2.

Canopy Cover

Currently the levels of stream shading (based on 2007 data) are within the desired condition of > 70%. Similar to Alternative 2, there would be no indirect effects on water temperature anticipated from Alternative 3. Changes to microclimate beyond the riparian corridors may affect habitat and dispersal of herpetofauna through changes to air temperature, wind speed, and relative humidity.

Water Temperature

Similar to Alternative 2, there would be no anticipated alterations to canopy cover, thus there would be no direct effects on water temperature expected from Alternative 3.

Large Woody Debris

Table 10 indicates that stream channels in subwatersheds 501.5053; 503.0010, 503.0011, and 503.0055 are lower than the desired condition for large woody debris. There is no proposed removal of snags within the first 50 feet from the perennial stream channel within the Old Forest Linkage (Riparian corridors). Beyond 50 feet snags may be removed if they contribute to ladder conditions (generally 10 to 50 ft high). Thinning to remove ladder fuels would also remove some trees that could have potential to reach a stream channel. Indirect negative effects to LWD recruitment would similar to those presented under Alternative 2.

Cumulative Effects

Past, present, and reasonably foreseeable actions within the project areas are displayed in Chapter 3 on page 25. For the Sugar Pine Project Area, other known activities are off-highway vehicle use, fuel, culture, and timber projects (including activities on private property), cattle grazing, road maintenance, and recreational use (both developed and undeveloped). Similar to Alternative 2:

- The combination of the Federal and private timber removal is not expected to cumulatively effect LWD recruitment, which would remain lower than desired within HUC8 subwatersheds 501.5053, 503.0010, 503.0011, and 503.0055.
- A cumulative watershed effect would not be anticipated from Alternative 3 (Gallegos 2009). Stream channels would be expected to remain overall stable, with some areas of localized instability.
- It is expected that cattle grazing will locally result in exposed streambanks and erosion. The majority of the primary use areas are within subwatersheds that drain to North Fork Willow Creek, rather than the Fresno or Merced Rivers.

Table 20 summarizes anticipated effects from the action alternatives (Alternatives 2, 3, and 4) on aquatic threatened (T), endangered (E), and sensitive (S) species, along with habitat for management indicator species (MIS).

Alternative 4

Gross acres of proposed treatments by subwatershed are displayed in Table 19. The actual area treated is expected to be less (approximately 85%) similar to Alternatives 2 and 3.

Table 11. Activities Proposed within Project Area Subwatersheds under Alternative 4

HUC8 Subwatershed	501.5003	501.5005	501.5006	501.5007	501.5053	501.5054	503.0008	503.0009	503.0010	503.0011	503.0055	503.3001	Total
Biomass/mastication/ pre-commercial thinning or tractor piling	0	5	194	132	124	11	297	323	627	33	162		**1908**
Mastication	19	8	79	0	34	18	110	294	3	138	80	14	**797**
Underburn	0	9	13	0	21	22	15	113	22	0	0		**215**
No Treatments	447	2207	352	536	1638	1429	523	1280	897	474	2322	1367	**13472**
Subwatershed Acres	466	2229	638	668	1817	1480	945	2010	1549	645	2564	1381	**16392**
% Subwatershed treated	4%	1%	45%	20%	10%	3%	45%	36%	42%	27%	9%	1%	**18%**

(Acres generated by GIS)

Direct Effects

The 5 acres of potential habitat for CRLF are the private ponds in the Sugar Pine and Fish Camp areas, which are not part of this project. Similar to Alternatives 2 and 3, there could be potential direct effects from crushing of RABO, WPT, RAMU, or BUCA by biomass thinning, tractor piling, or mastication, or from burning of animals.

Similar to Alternatives 2 and 3, it would be expected that direct effects to herpetofauna would be limited. Project design measures include the Old Forest Linkage corridors for Pacific fisher. These migration corridors extend 150 feet from both streambanks along the perennial streams within the project area. There are no proposed treatments within the inner 50 feet from each streambank. The outer 50 feet would implement hand treatments to remove the understory ladder fuels. No heavy equipment would be allowed within 100 feet of the streambank within these corridors. During primary periods of project operations (May – Sept) it is expected frogs and turtles would remain within the riparian areas due to presence of water; the microclimate provided; and riparian connectivity, except during rainy periods. The possibility of direct effects from crushing would be most likely in October when species leave streamside areas for overwintering sites, or during rainy periods when species may move beyond riparian areas. Operation of heavy equipment ceases during periods of prolonged precipitation to prevent compaction.

Introduced fire could directly affect herpetofauna similar to Alternatives 2 and 3. Allowing fire to creep into the SMZ (as opposed to active introduction) would provide opportunity for herpetofauna to move away from areas burning, but not eliminate the possibility of mortality.

Direct effects to listed herpetofauna would not be anticipated from implementing Alternative 4 due to project design measures; non-detection of listed species during surveys; and no records of these species occurring within the project area subwatersheds.

Indirect Effects

Biomass thinning to reduce ladder fuels would occur on over approximately 1,065 acres under Alternative 4, which is 850 acres more than Alternative 2. Underburning is proposed over approximately 215 acres, and mastication on 800 acres. Table 17 identifies that perennial streams adjacent to treatment areas represent approximately 320 acres of foothill yellow-legged frog; 630 acres western pond turtle; 90 acres mountain yellow-legged frog; 30 acres of Yosemite toad; 8 miles of benthic macroinvertebrate, and 7 acres of Pacific tree frog habitat. The RABO habitat acreage is within WPT habitat (overlap). Within the RABO and WPT habitat are 90 acres that would have no treatments (corridors along perennial and intermittent streams). Similarly, 30 acres of RAMU habitat occurs along no treatment corridors. Effects from compaction and stand density would be similar to Alternatives 2 and 3, although somewhat less due to fewer trees being removed. Alterations to habitat complexity, air temperature, decreased soil moisture or relative humidity within areas adjacent to perennial streams could influence herpetofauna.

Canopy Cover

Currently the levels of stream shading (based on 2007 data) are within the desired condition of > 70%. Similar to Alternatives 2 and 3, there would be no indirect effects on water temperature anticipated from Alternative 4. Changes to microclimate beyond the riparian corridors may affect habitat and dispersal of herpetofauna through changes to air temperature, wind speed, and relative humidity.

Water Temperature

Similar to Alternatives 2 and 3, there would be no anticipated alterations to canopy cover, thus there would be no direct effects on water temperature expected from Alternative 4.

Large Woody Debris

Under Alternative 4, there is no proposed removal of snags within the first 50 feet from the perennial stream channel within the Old Forest Linkage (riparian corridors). Beyond 50 feet snags may be removed if they contribute to ladder conditions (generally 10 to 50 ft high). Thinning to remove ladder fuels would also remove some trees that could have potential to reach a stream channel, although the number would be fewer than Alternatives 2 or 3. Indirect negative effects to LWD recruitment would similar, but less than those presented under Alternatives 2 and 3 due to greater retention of commercial sized trees.

Cumulative Effects

Past, present, and reasonably foreseeable actions within the project areas are displayed in Chapter 3 on page 25. For the Sugar Pine Project Area, other known activities are off-highway vehicle use, fuel, culture, and timber projects (including activities on private property), cattle grazing, road maintenance, and recreational use (both developed and undeveloped). Similar to Alternatives 2 and 3:

- The combination of the Federal and private timber removal is not expected to cumulatively effect LWD recruitment, which would remain lower than desired, within HUC8 subwatersheds 501.5053, 503.0010, 503.0011, and 503.0055.
- A cumulative watershed effect would not be anticipated from Alternative 4 (Gallegos 2009). Stream channels would be expected to remain overall stable, with some sites of localized instability.
- It is expected that cattle grazing will locally result in exposed streambanks and erosion. The majority of the primary use areas are within subwatersheds that drain to North Fork Willow Creek, rather than the Fresno or Merced Rivers.

Table 20 summarizes effects to TES species and MIS habitat.

Table 12. Summary from Analyses for Aquatic Threatened, Endangered, Sensitive (BA/BE), and Management Indicator Species for Effects from Project Alternatives

Species (status)	Determination
California red-legged frog (T)	No effect
Foothill yellow-legged frog (S)	May affect individuals, but is not likely to lead to Federal listing or loss of viability.
Western pond turtle (S)	May affect individuals, but is not likely to lead to Federal listing or loss of viability.
Mountain yellow-legged frog (S)	May affect individuals, but is not likely to lead to Federal listing or loss of viability.
Yosemite toad (S)	No effect
Benthic Macroinvertebrates Habitat (MIS)	Stable
Pacific tree frog Habitat (MIS)	Stable

Source: Strand 2009, Strand 2009a

Terrestrial Management Indicator Species

The purpose of the terrestrial MIS report is to evaluate and disclose the impacts of the Sugar Pine Adaptive Management Project on the habitat of terrestrial Management Indicator Species (MIS) identified in the Sierra NF LRMP (USDA-FS 1991) as amended by the Sierra Nevada Forests Management Indicator Species Amendment (SNF MIS Amendment) Record of Decision (USDA Forest Service 2007a). The MIS report documents the effects of the proposed action and alternatives on the habitat of selected project-level MIS.

MIS are animal species identified in the SNF MIS Amendment Record of Decision (ROD) signed December 14, 2007, which was developed under the 1982 National Forest System Land and Resource Management Planning Rule (1982 Planning Rule) (36 CFR 219). The current rule applicable to project decisions is the 2004 Interpretive Rule, which states "Projects implementing land management plans…must be developed considering the best available science in accordance with §219.36(a)…and must be consistent with the provisions of the governing plan." (Appendix B to §219.35). Guidance regarding MIS set forth in the Sierra NF LRMP as amended by the 2007 SNF MIS Amendment ROD directs Forest Service resource managers to (1) at project scale, analyze the effects of proposed projects on the habitat of each MIS affected by such projects, and (2) at the bioregional scale, monitor populations and/or habitat trends of MIS, as identified in the Sierra NF LRMP as amended.

Affected Environment

MIS Habitat Status and Trend

All habitat monitoring data are collected and/or compiled at the bioregional scale, consistent with the LRMP as amended by the 2007 Sierra NF MIS Amendment ROD (USDA Forest Service 2007a).

Habitats are the vegetation types (for example, early seral coniferous forest) or ecosystem components (for example, snags in green forest) required by an MIS for breeding, cover, and/or feeding. MIS for the Sierra Nevada National Forests represent 10 major habitats and 2 ecosystem components (USDA-FS 2007a and project record). These habitats are defined using the California Wildlife Habitat Relationship (CWHR) System (CDFG 2005). The CWHR System provides the most widely used habitat relationship models for California's terrestrial vertebrate species (ibid). Appendix D includes tables explaining the acronyms used for available habitat stages in the CWHR system. It is also described in detail in the Sierra NF Bioregional MIS Report (USDA Forest Service 2008).

Habitat status is the current amount of habitat on the Sierra Nevada Forests. Habitat trend is the direction of change in the amount or quality of habitat over time. The methodology for assessing habitat status and trend is described in detail in the Sierra NF Bioregional MIS Report (USDA Forest Service 2008).

MIS Population Status and Trend

All population monitoring data are collected and/or compiled at the bioregional scale, consistent with the LRMP as amended by the 2007 Sierra NF MIS Amendment ROD (USDA Forest Service 2007a). The information is presented in detail in the 2008 Sierra NF Bioregional MIS Report (USDA Forest Service 2008).

Population monitoring strategies for MIS of the Sierra NF are identified in the 2007 Sierra Nevada Forests Management Indicator Species (SNF MIS) Amendment ROD (USDA Forest

Service 2007a). Population status is the current condition of the MIS related to the population monitoring data required in the 2007 SNF MIS Amendment ROD for that MIS. Population trend is the direction of change in that population measure over time.

There are a myriad of approaches for monitoring populations of MIS, from simply detecting presence to detailed tracking of population structure (USDA Forest Service 2001, Appendix E, page E-19). A distribution population monitoring approach is identified for all of the terrestrial MIS in the 2007 SNF MIS Amendment, except for the greater sage-grouse (USDA Forest Service 2007a). Distribution population monitoring consists of collecting presence data for the MIS across a number of sample locations over time. Presence data are collected using a number of direct and indirect methods, such as surveys (population surveys), bird point counts, tracking number of hunter kills, counts of species sign (such as deer pellets), and so forth. The specifics regarding how these presence data are assessed to track changes in distribution over time vary by species and the type of presence data collected, as described in the Sierra NF Bioregional MIS Report (USDA Forest Service 2008).

Methodology for Analysis

Project-level effects on MIS habitat are analyzed and disclosed as part of environmental analysis under the National Environmental Policy Act (NEPA). This involves examining the impacts of the proposed project alternatives on MIS habitat by discussing how direct, indirect, and cumulative effects will change the habitat in the analysis area.

These project-level impacts to habitat are then related to broader scale (bioregional) population and/or habitat trends. The appropriate approach for relating project-level impacts to broader scale trends depends on the type of monitoring identified for MIS in the LRMP as amended by the SNF MIS Amendment ROD. Hence, where the Sierra NF LRMP as amended by the SNF MIS Amendment ROD identifies distribution population monitoring for an MIS, the project-level habitat effects analysis for that MIS is informed by available distribution population monitoring data, which are gathered at the bioregional scale. The bioregional scale monitoring identified in the Sierra NF LRMP, as amended, for MIS analyzed for the Sugar Pine Adaptive Management Project is summarized in Section 3 of the Terrestrial MIS report.

Adequately analyzing project effects to MIS generally involves the following steps:

- Identifying which habitat and associated MIS would be either directly or indirectly affected by the project alternatives; these MIS are potentially affected by the project.
- Summarizing the bioregional-level monitoring identified in the LRMP, as amended, for this subset of MIS.
- Analyzing project-level effects on MIS habitat for this subset of MIS.
- Discussing bioregional scale habitat and/or population trends for this subset of MIS.
- Relating project-level impacts on MIS habitat to habitat and/or population trends at the bioregional scale for this subset of MIS.

These steps are described in detail in the Pacific Southwest Region draft document “MIS Analysis and Documentation in Project-Level NEPA, R5 Environmental Coordination” (May 25, 2006). This Management Indicator Species (MIS) Report documents application of the above steps to select project-level MIS and analyze project effects on MIS habitat for the Sugar Pine Adaptive Management Project.

Mitigation and Monitoring

Special project design measures for the Sugar Pine Adaptive Management Project were developed in concert with the Bass Lake Ranger District interdisciplinary team, USFWS, PSW Research scientists, and concerned public participation groups. These design measures would be implemented under any of the three action Alternatives. Within this project area special considerations have been given to maintaining higher levels of biodiversity through actions such as delineating Old Forest Linkages (OFLs) surrounding perennial streams (see USDA-FS 2009a and 2009b for a description of OFLs). Higher levels of biodiversity have also been planned for by marking retention groups of large diameter trees. Two hundred and eighty (280) such tree groups were identified in the main project area, and an additional 74 were identified in the hydrology study area. These tree groups are composed of a cluster of three or more trees, 30 inch dbh or greater, with touching crowns, and will benefit those species which utilize dense groupings of large trees. Another project design measure which will maintain biodiversity is the identification of retention areas around large oaks within treatment units. Two to three large oaks per acre were identified and marked with paint. These oaks will retain a zone of no activity around them measuring 35 feet, or dripline circumference around the oak (whichever is greater). The delineation of OFLs, retention of large tree groups, and oak no treatment zones will ensure a heterogeneous post treatment landscape resulting in the continued accessibility of both hiding cover and prey availability within these areas of biodiversity. (USDA Forest Service 2009e)

The project is designed to improve habitat conditions through the acceleration of late-successional habitat characteristics, while still maintaining current functional habitat. Specific project design criteria include: canopy closure will be maintained at 60 to 70% or greater where available; ground disturbance will be limited to those guidelines with the LRMP as amended; vegetation species diversity and composition will be maintained; no management will occur in designated riparian reserves; and retention of snags and downed logs would be retained at 80 to 100% of the average numbers found within mature and old growth stands within the Sierra NF. Any snag felled for safety reasons will be left on site as downed woody debris. Additional cull logs will be left on site from the logging operation as well. All riparian reserves within the project have been identified and buffers established. In addition, no operations will occur during the wet weather season. (USDA Forest Service 2009e)

Category 1 MIS

Species that will not be discussed further in this document include Category 1 and Category 2 MIS. Category 1 defines MIS whose habitat does not occur in or adjacent to the project area. For the Sugar Pine Adaptive Management Project Category 1 MIS include the greater sage-grouse and the black-backed woodpecker. No sagebrush (SGB) or burned forest habitat is currently present in or adjacent to the project area.

Category 2 MIS

Category 2 defines MIS whose habitat is in or adjacent to the project area, but whose habitat would not be directly or indirectly affected by the project. For the Sugar Pine Adaptive Management Project, Category 2 MIS include: yellow warbler, sooty grouse, California spotted owl, American marten, and northern flying squirrel. Though habitat for these species occurs within the project area, that habitat will not be directly or indirectly affected by the project. The primary reasons for this appraisal are the Sugar Pine Adaptive Management Project design features which limit the activities reducing canopy closure. These design features, as well as applicable Forest Service standards and guidelines protecting species habitats are discussed further in the Sugar Pine Adaptive Management Project MIS Report for each of the Category 2 MIS.

Category 3 MIS

The MIS whose habitat would be either directly or indirectly affected by the Sugar Pine Adaptive Management Project, identified as Category 3, are carried forward in this analysis, which will evaluate the direct, indirect, and cumulative effects of the proposed action and alternatives on the habitat of these MIS (see project record). The MIS selected for project-level MIS analysis for the Sugar Pine Adaptive Management Project are: fox sparrow, mule deer, mountain quail, and hairy woodpecker.

The following section documents the analysis for the following Category 3 species: fox sparrow, mule deer, mountain quail, and hairy woodpecker. The analysis of the effects of the Sugar Pine Adaptive Management Project on the terrestrial MIS habitat for the selected project-level MIS is conducted at the project scale. The analysis used the California Wildlife Habitat Relationship model (CWHR (Mayer and Laudenslayer 1988)) data to determine vegetative type within the entire Sugar Pine Adaptive Management Project Boundary. Existing acres of vegetation type (base vegetation layer) were determined using the Sierra National Forest Corporate GIS vegetation feature class of 2001 ExistingVeg2001_pl. This base layer was refined using existing structure analysis from more than 50 stand examination plot data collected in 2007 and 2008, as well as forest aerial photography interpretation from the 2001 flightline, and 1 meter resolution satellite imagery from the National Agricultural Imagery Program (NAIP). Treatment acres relative to existing vegetation were based on mapping and field visits conducted by the Bass Lake Ranger District Silviculturist. These field visits refined the base vegetation layer and determined the net acres of treatment. Detailed information on the MIS is documented in the SNF Bioregional MIS Report (USDA Forest Service 2008), which is hereby incorporated by reference.

MIS Project-level Effects Analysis - Shrubland (West-Slope Chaparral) Habitat

Current Condition of the Habitat Factor(s) in the Project Area: There are a total of 71 acres of shrubland (chaparral) habitat within the project boundary. Sixty-five (65) acres are classified as montane chaparral (MCP) and the remaining 6 acres are classified as mixed chaparral (MCH). Of the 71 acres of chaparral within the project boundary, only 38%, or 27 acres occur within treatment analysis areas and have the potential to be treated under this project while only 21 acres are actually proposed to be treated. Please refer to Tables 40 and 41 in Appendix D (Sugar Pine CWHR Data Table, Main Project Area and Hydrology Study Area, Present Compared to Alternative 2 Proposal) for a full breakdown of all CWHR habitat types within the project boundary pre- and post-treatment.

Alternative 1 – No Action

Alternative 1 is the No Action Alternative. Under the No Action Alternative, current management plans would continue to guide management of the project area. This includes all ongoing activities with existing decisions or permits that would not be changed if this alternative were selected including: underburning, plantation maintenance, cattle grazing, recreation, and recreation residences. The No Action Alternative would not implement the Sugar Pine Adaptive Management Project to reduce fire ladder conditions (thinning); pile slash for burning; burn slash piles; masticate and/and or precommercially thin stands; plant trees; reduce fuel loading through controlled burning; construct handline around jackpot burn areas; or construct and reconstruct roads.

Direct and Indirect Effects to Habitat

There are no direct effects to shrubland habitat under this alternative. There is a potential for indirect effects under the No Action Alternative as the continued immediate threat of wildfire

would remain unabated. In failing to make an attempt at density management of the stands, the eventual changes through drought stress and subsequent insect and disease mortality acceleration would exacerbate the threat of stand replacing fire. Additionally, the high probability of a drying climate change throughout the Western United States would have the potential to further compound these effects (USDA Forest Service 2009a, 2009c, 2009d).

Cumulative Effects to Habitat in the Analysis Area

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

The cumulative effects boundary area was identified as the extent of the 12 HUC 8 subwatersheds contained in or adjacent to the project boundary: 503.0008, 503.0009, 503.0010, 503.0011, 503.0055, 503.3001, 501.5003, 501.5005, 501.5006, 501.5007, 501.5053, and 501.5054 and covers an area of 16,381 acres. Past, present, and reasonably foreseeable actions within all 12 subwatersheds surrounding the project area are displayed in Table 3 of the Sugar Pine Adaptive Management Project Environmental Impact Statement (USDA-FS 2009a, USDA 2009f).

Cumulative Effects Conclusion

Under Alternative 1 the Sugar Pine Project would not be implemented. The immediate effect of wildfires in shrubland habitat would be a loss of function for that portion of the habitat until shrubs recovered enough to provide foraging, nesting, and cover habitat. However because most shrubland ecosystems are fire adapted, and because most fires burn with a mosaic of severity and intensity across the landscape, post fire shrub habitats may still provide forage, nesting, and cover for many species. Unfortunately, without fuels treatments, the extent of shrublands severely impacted by wildfire is expected to be much greater and take much longer for recovery, having more lasting impacts on the distribution and abundance of this habitat type on the landscape.

Within the cumulative effects analysis area, other known activities are off-highway vehicle use, fuel, culture, and timber projects (past Federal and activities on private property), cattle grazing, road maintenance, and recreational use (both developed and undeveloped). Many of the ongoing management activities within the cumulative effects boundary do not contribute to significant cumulative impacts upon shrubland habitat. Of the actions elevated within the analysis area, road maintenance along the 86 miles of road and plantation maintenance of the 115 acres of existing plantation within the extended subwatershed boundary area would be the most likely actions to affect shrubland habitat. Changes in shrubland densities would be relatively short-lived because many shrubs would sprout within a year (depending on shrub type, treatment type, and treatment intensity). There are a total of 861 acres of MCH and MCP habitat within the cumulative effects boundary of this project, of which a very small percentage may be treated during road and plantation maintenance activities. Any cumulative effects to shrubland habitat would be minimal as a result of choosing Alternative 1, and in the absence of a catastrophic wildfire, habitat would be expected to remain in fair condition.

Alternative 2 – Proposed Action

Direct and Indirect Effects to Habitat

Under Alternative 2 direct effects to 21 acres of shrubland habitat are proposed through mastication and prescribed burning treatments. These 21 acres would be treated to maintain the growth and vigor of existing trees, or to create conditions suitable for the establishment of planted trees. The change in seral stage of 21 acres of chaparral out of 71 acres within the project boundary is a treatment of 38% of the total chaparral available within the Sugar Pine Project

Boundary. There are an additional 50 acres of shrubland habitat identified within the project boundary that are not proposed for treatment under the current project, and would still provide suitable habitat for fox sparrow during implementation of mastication and burning activities.

Two (2) acres of proposed prescription burning would occur in MCP habitat in the hydrology study area, and 19 acres of proposed mastication treatments would occur in MCP habitat in the main project area. Immediately after treatment, these 21 acres would not be useable as shrubland habitat because shrubs would be reduced below 20 percent cover. This shrub cover reduction would be temporary, and shrubs would likely begin to recover in less than one year since chemicals would not be used in either treatment. Shrubland habitat that is currently senescent would be brought back to an early seral stage chaparral, increasing its vigor and habitat value.

Cumulative Effects to Habitat in the Analysis Area

A table of current and future projects within the analysis area for the Sugar Pine Adaptive Management Project was presented in the Cumulative Effects discussion of Alternative 1. There are a total of 861 acres of MCH and MCP habitat within the cumulative effects boundary of this project. This project proposes treating at most 3% of the existing shrubland habitat within the cumulative effects boundary.

Cumulative Effects Conclusion

There are a total of 861 acres of MCH and MCP habitat within the cumulative effects boundary of this project. This project proposes treating at most 3% of the existing shrubland habitat within the cumulative effects boundary. Further activities taking place within the cumulative effects boundary that may alter shrubland habitat include road brushing and plantation maintenance. These activities may alter a very small percentage of the available shrubland habitat through removal of senescent chaparral bordering roads and inside plantations, resulting in natural regeneration of early seral stage chaparral habitat.

Alternative 3

Direct, Indirect, and Cumulative Effects to Habitat and Conclusion

The proposed treatments for the shrubland habitat within Alternative 3 are the same as for Alternative 2, therefore the direct, indirect, and cumulative effects for Alternative 3 would be the same as those discussed under the Proposed Action.

Alternative 4

The proposed treatments for the shrubland habitat within Alternative 4 are the same as for Alternative 2, therefore the direct, indirect, and cumulative effects for Alternative 4 would be the same as those discussed under the Proposed Action.

Summary of Fox Sparrow Status and Trend at the Bioregional Scale

The Sierra NF LRMP (as amended by the SNF MIS Amendment) requires bioregional-scale habitat and distribution population monitoring for the fox sparrow; hence, the shrubland effects analysis for the Sugar Pine Adaptive Management Project must be informed by both habitat and distribution population monitoring data. The sections below summarize the habitat and distribution population status and trend data for the fox sparrow. This information is drawn from the detailed information on habitat and population trends in the Sierra Nevada Forests Bioregional MIS Report (USDA Forest Service 2008), which is hereby incorporated by reference.

Habitat Status and Trend

There are currently 922,000 acres of west-slope chaparral shrubland habitat on National Forest System lands in the Sierra Nevada. Within the last decade, the trend is stable.

Population Status and Trend

The fox sparrow has been monitored in the Sierra Nevada at various sample locations by avian point counts and breeding bird survey protocols, including: 1997 to present – Lassen National Forest (Burnett and Humple 2003, Burnett et al. 2005); 2002 to present – Plumas and Lassen National Forests (Sierra Nevada Research Center 2007); on-going monitoring through California Partners in Flight Monitoring Sites (CPIF 2002); 1992 to 2005 – Sierra Nevada Monitoring Avian Productivity and Survivorship (MAPS) stations (Siegel and Kaschube 2007); and 1968 to present – BBS routes throughout the Sierra Nevada (Sauer et al. 2007). These data indicate that fox sparrows continue to be present at these sample sites, and current data at the rangewide, California, and Sierra Nevada scales indicate that, although there may be localized declines in the population trend, the distribution of fox sparrow populations in the Sierra Nevada is stable.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale Fox Sparrow Trend

The 861 acres of shrubland habitat that exists within the Cumulative Effects (CE) boundary account for less than 1% of the 922,000 acres that exists at the bioregional scale, and only 21 of these acres are proposed for treatment. Therefore, cumulative impacts within the CE boundary would not alter the existing bioregional trends in this habitat, nor would they lead to a change in the distribution of fox sparrows across the Sierra Nevada bioregion.

Oak-Associated Hardwoods and Hardwood/Conifer Habitat (Mule deer)

Current Condition of the Habitat Factor(s) in the Project Area

There are currently 850 acres of montane hardwood and montane hardwood conifer habitat within the Sugar Pine Adaptive Management Project boundary of which 53% or 450 of these acres are within treatment analysis areas. Please refer to Tables 40 and 41 located in Appendix D (Sugar Pine CWHR Data Table, Main Project Area and Hydrology Study Area, Present Compared to Alternative 2 Proposal) for a full breakdown of all CWHR habitat types within the Project boundary pre- and post-treatment.

Alternative 1 – No Action

Direct and Indirect Effects to Habitat

There would be no direct effects to montane hardwood or montane hardwood-conifer habitat under this alternative. There is a potential for indirect effects under the No Action Alternative as the continued immediate threat of wildfire would remain unabated. In failing to make an attempt at density management of the adjacent conifer stands, the eventual changes through drought stress and subsequent insect and disease mortality acceleration would exacerbate the threat of stand replacing fire. Additionally, the high probability of a drying climate change throughout the Western United States would have the potential to further compound these effects (USDA Forest Service 2009a, 2009c, 2009d).

Cumulative Effects to Habitat in the Analysis Area and Conclusion

Past, present, and reasonably foreseeable actions within the 12 subwatersheds inside and adjacent to the project area are displayed in Table 3 of this document, referenced from the Sugar Pine

Adaptive Management Project Environmental Impact Statement (USDA-FS 2009a). Under Alternative 1 the Sugar Pine Project would not be implemented. The immediate effect of wildfires in hardwood and hardwood/conifer habitat would be a loss of function for that portion of the habitat until the hardwoods recovered enough to provide foraging, and nesting habitat. However because most hardwood ecosystems are fire adapted, and because most fires burn with a mosaic of severity and intensity across the landscape, post fire hardwood habitats may still provide forage, nesting, and cover for many species. Unfortunately, without fuels treatments in the conifer types, the extent of hardwood habitat severely impacted by wildfire is expected to be much greater and take much longer for recovery, having more lasting impacts on the distribution and abundance of this habitat type on the landscape.

Many of the ongoing management activities within the cumulative effects boundary do not contribute to significant cumulative impacts upon montane hardwood or hardwood/conifer habitat. Of the cumulative effects actions elevated within the analysis area, private land residential development and roadside hazard tree removal have the greatest potential to alter hardwood and hardwood conifer habitat. There is a total of 3341 acres of MHC and MHW habitat within the cumulative effects boundary. Hardwood and hardwood/conifer habitats account for 20% of the total available habitat in the cumulative effects boundary. It is possible that a very small percentage of MHC and MHW habitat may be removed as hazards during roadside hazard tree removal or as residential construction continues within the cumulative effects boundary. Any cumulative effects to hardwood and hardwood/conifer habitat would be minimal as a result of choosing Alternative 1, and in the absence of a catastrophic wildfire, habitat would be expected to remain in good condition.

Alternative 2 – Proposed Action

Direct and Indirect Effects to Habitat

A direct effect of implementing Alternative 2 would be a change in CWHR type for 2 acres of mule deer habitat. Although not the intent of the proposed prescribed burning, it is possible that 2 acres of MHC4D habitat would be converted to MHC4M habitat through flare-ups during burning activities. This would represent a less than 1% decrease in the amount of MHC4D habitat within the project boundary, and a 3% increase in the amount of MHC4M habitat available within the project boundary. With the application of the LRMP standards and guidelines, direct and indirect effects to deer will be minimal because the most important habitat types to deer will receive the management emphasis called for in the LRMP, and the Sugar Pine Adaptive Management Project uneven-aged silvicultural treatments and prescribed burning will tend to improve deer foraging habitat. Forest Service standards and guidelines pertaining to hardwood habitat are included in the project record. Additional protections for hardwood habitat that will be applied to this project include the formation of oak no treatment areas, described on page 15 of this document and in the project EIS and BE/BA (US Forest Service 2009a, 2009b).

Cumulative Effects to Habitat in the Analysis Area and Conclusion

Of the cumulative effects actions elevated within the analysis area, private land residential development and roadside hazard tree removal have the greatest potential to alter hardwood and hardwood conifer habitat. There is a total of 3341 acres of MHC and MHW habitat within the cumulative effects boundary. The proposed treatment of 2 acres would constitute a treatment of less than 1% of the total available habitat within the cumulative effects boundary. Additional effects to habitat through roadside hazard tree work and private land residential development will be insignificant compared with the amount of habitat available.

Alternative 3

Direct, Indirect, and Cumulative Effects to Habitat and Conclusion

The proposed treatments for the montane hardwood and montane hardwood/conifer habitat within Alternative 3 are the same as for Alternative 2, therefore the direct, indirect, and cumulative effects for Alternative 3 would be the same as those discussed under the Proposed Action.

Alternative 4

Direct, Indirect, and Cumulative Effects to Habitat and Conclusion

The proposed treatments for the montane hardwood and montane hardwood/conifer habitat within Alternative 4 are very limited in scope and will not change any CWRH habitat type, size, or density, therefore no direct effects to montane hardwood and montane hardwood/conifer habitat would be expected to occur with implementation of Alternative 4. Indirect effects can be expected by failing to make an attempt at density management of the stands, the eventual changes through drought stress and subsequent insect and disease mortality acceleration would exacerbate the threat of stand replacing fire. Additionally, the high probability of a drying climate change throughout the Western United States would have the potential to further compound these effects. (USDA Forest Service 2009a, 2009c, 2009d).

Summary of Mule Deer Status and Trend at the Bioregional Scale

The Sierra NF LRMP (as amended by the SNF MIS Amendment) requires bioregional-scale habitat and distribution population monitoring for the mule deer; hence, the oak-associated hardwood and hardwood/conifer effects analysis for the Sugar Pine Adaptive Management Project must be informed by both habitat and distribution population monitoring data. The sections below summarize the habitat and distribution population status and trend data for the mule deer. This information is drawn from the detailed information on habitat and population trends in the Sierra Nevada Forests Bioregional MIS Report (USDA Forest Service 2008), which is hereby incorporated by reference.

Habitat Status and Trend

There are currently 809,000 acres of oak-associated hardwood and hardwood/mixed conifer habitat on National Forest System lands in the Sierra Nevada. The trend is slightly increasing (within the last decade, changing from 5% to 7% of the acres on National Forest System lands).

Population Status and Trend

The mule deer has been monitored in the Sierra Nevada at various sample locations by herd monitoring (spring and fall) and hunter survey and associated modeling (CDFG 2007). California Department of Fish and Game (CDFG) conducts surveys of deer herds in early spring to determine the proportion of fawns that have survived the winter, and conducts fall counts to determine herd composition (CDFG 2007). This information, along with prior year harvest information, is used to estimate overall herd size, sex and age rations, and the predicted number of bucks available to hunt (ibid). These data indicate that mule deer continue to be present across the Sierra Nevada, and current data at the rangewide, California, and Sierra Nevada scales indicate that, although there may be localized declines in some herds or Deer Assessment Units, the distribution of mule deer populations in the Sierra Nevada is stable.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale Mule Deer Trend

The 3341 acres of montane hardwood and montane hardwood/conifer habitat that exists within the Cumulative Effects boundary account for less than 1% of the 809,000 acres that exists at the bioregional scale. The change of 2 acres out of 809,000 acres of oak-associated hardwood and hardwood/conifer habitat in the Sugar Pine Adaptive Management Project Area will not alter the existing trend in the habitat, nor will it lead to a change in the distribution of mule deer across the Sierra Nevada bioregion.

Early and Mid Seral Coniferous Forest Habitat (Mountain quail)

Current Condition of the Habitat Factor(s) in the Project Area

There is currently 3,566 acres of early and mid seral coniferous forest habitat within the Sugar Pine Adaptive Management Project boundary of which 58% or 2064 acres of this habitat are within treatment analysis areas. Please refer to Tables 40 and 41 located in Appendix D (Sugar Pine CWHR Data Table, Main Project Area and Hydrology Study Area, Present Compared to Alternative 2 Proposal) for a full breakdown of all CWHR habitat types within the Project boundary pre- and post-treatment.

Alternative 1 – No Action

Direct and Indirect Effects to Habitat

There would be no direct effects to early and mid seral coniferous habitat under this alternative. There is a potential for indirect effects under the No Action Alternative as the continued immediate threat of wildfire would remain unabated. In failing to make an attempt at density management of the stands, the eventual changes through drought stress and subsequent insect and disease mortality acceleration would exacerbate the threat of stand replacing fire. Additionally, the high probability of a drying climate change throughout the Western United States would have the potential to further compound these effects (USDA Forest Service 2009a, 2009c, 2009d).

Cumulative Effects to Habitat in the Analysis Area and Conclusion

Past, present, and reasonably foreseeable actions within the 12 subwatersheds inside and adjacent to the project area are displayed in the Sugar Pine Adaptive Management Project Environmental Impact Statement (USDA-FS 2009a). Under Alternative 1 the Sugar Pine Project would not be implemented. The immediate effect of wildfires in early and mid seral coniferous habitat would be a loss of function for that portion of the habitat until the habitat recovered enough to provide foraging, and nesting habitat. Without fuels treatments, the extent of early and mid seral habitat severely impacted by wildfire is expected to be much greater and take much longer for recovery, having more lasting impacts on the distribution and abundance of this habitat type on the landscape.

There is a total of 8171 acres of early and mid seral coniferous habitat within the cumulative effects boundary. These habitat types constitute 50% of the total available habitat in the cumulative effects boundary. Many of the ongoing management activities within the cumulative effects boundary do not contribute to significant cumulative impacts upon early and/or mid seral coniferous forest habitat. Of the cumulative effects actions elevated within the analysis area private land residential development, roadside hazard tree removal, on-going plantation maintenance, and past and future timber sale activity have the greatest potential to alter early and mid seral coniferous habitat.

It is possible that a small percentage of early and mid seral stage coniferous habitat may be removed as residential construction continues within the cumulative effects boundary. It is reasonable to assume that some portion of the roadside hazard trees are in the later stages of early seral habitat, as well as mid and late seral habitat. Nevertheless, removal of a few trees within a stand does not change its habitat rating. Therefore, roadside hazard tree removal would not impact either early, mid, or late seral habitat. Early and mid seral habitats treated under ongoing plantation maintenance projects likely have or will experience better health, vigor, and growth by being released from competition.

About 2,640 acres of thinning occurred within the CE boundary during the 1980s, with an additional 2000 to 3000 acres proposed for future treatment under the Fish Camp Adaptive Management project in the next few years. Due to the thinning prescriptions implemented under previous projects, seral stages did not change. Stands merely reflected less density. It is expected that those stands treated have experienced better health, vigor, and growth and will be less susceptible to wildfires. Proposed Fishcamp Project prescriptions should mirror those proposed under the Sugar Pine Adaptive Management project, including any special design measures for wildlife recently developed for the Sugar Pine Project. Any cumulative effects to early and mid seral coniferous habitat within the cumulative effects boundary would be minimal as a result of choosing Alternative 1, and in the absence of a catastrophic wildfire, habitat would be expected to remain in good condition.

Alternative 2 – Proposed Action

Direct and Indirect Effects to Habitat

Under Alternative 2, minimal changes in CWHR composition of early and mid seral coniferous habitat are proposed for a little over 1% of the 3,566 acres of habitat within the project boundary. 37 acres of PPN3D would be converted to PPN3M through proposed mechanical thinning treatments. One (1) acre of PPN4D would likely be converted to PPN4M through proposed prescribed burning. Three (3) acres of SMC3D would be converted to SMC3M through proposed mechanical thinning work, and 5 acres of SMC4D would be converted to SMC4M through proposed prescription burning. The remaining 2,018 acres of early and mid seral coniferous habitat within the treatment analysis acres will not experience a change in CWHR habitat type, size, or density under the Alternative 2 proposal. Due to the thinning prescriptions proposed, additional seral stage changes beyond those described will not change. Stands will merely reflect less density. Where stand density is at 60% or greater, it will not be brought below this level. It is expected that those stands treated will experience better health, vigor, and growth and will be less susceptible to wildfires.

Cumulative Effects to Habitat in the Analysis Area and Conclusion

There is a total of 8,171 acres of early and mid seral coniferous habitat within the 12 subwatershed cumulative effects boundary. These habitat types constitute 50% of the total available habitat within that boundary. Many of the ongoing management activities within the cumulative effects boundary will not contribute to significant cumulative impacts upon early and/or mid seral coniferous forest habitat. Of the cumulative effects actions elevated within the analysis area private land residential development, roadside hazard tree removal, on-going plantation maintenance, and past and future timber sale activity have the greatest potential to alter early and mid seral coniferous habitat as discussed under the cumulative effects section for Alternative 1. Additional effects through Alternative 2 proposed canopy cover changes of 0.5% of the total habitat in the cumulative effects boundary are insignificant, especially when one considers the vast amount of available early and mid seral coniferous habitat present within the cumulative effects boundary.

Alternative 3

Direct, Indirect, and Cumulative Effects to Habitat and Conclusion

The proposed treatments for the early and mid seral stage coniferous habitat within Alternative 3 are nearly the same as for Alternative 2. Under Alternative 3, minimal changes in CWHR composition of early and mid seral coniferous habitat are proposed for a little over 1% of the 3,566 acres of habitat within the project boundary. Seventeen (17) acres of PPN3D would be converted to PPN3M through proposed mechanical thinning work. One (1) acre of PPN4D would likely be converted to PPN4M through proposed prescribed burning. Three (3) acres of SMC3D would be converted to SMC3M through proposed mechanical thinning work, and 5 acres of SMC4D would be converted to SMC4M through proposed prescription burning. The remaining 2,018 acres of early and mid seral coniferous habitat within the treatment analysis acres will not experience a change in CWHR habitat type, size, or density under the Alternative 3 proposal. Additional effects through Alternative 3 proposed canopy cover changes of 0.3% of the total habitat in the cumulative effects boundary are insignificant considering the vast amount of available habitat within the cumulative effects boundary. Due to the thinning prescriptions proposed, additional seral stage changes beyond those described will not change. Stands will merely reflect less density. Where stand density is at 60% or greater, it will not be brought below this level. It is expected that those stands treated will experience better health, vigor, and growth and will be less susceptible to wildfires.

Alternative 4

Direct, Indirect, and Cumulative Effects to Habitat and Conclusion

The proposed treatments for the early and mid seral stage coniferous habitat within Alternative 4 are very limited in scope and will not change any CWRH habitat type, size, or density, therefore no direct effects to early and mid seral coniferous habitat would be expected to occur with implementation of Alternative 4.

Indirect effects can be expected by failing to make an attempt at density management of the stands, the eventual changes through drought stress and subsequent insect and disease mortality acceleration would exacerbate the threat of stand replacing fire. Additionally, the high probability of a drying climate change throughout the Western United States would have the potential to further compound these effects (USDA Forest Service 2009a, 2009c, 2009d).

Summary of Mountain Quail Status and Trend at the Bioregional Scale

The Sierra NF LRMP (as amended by the SNF MIS Amendment) requires bioregional-scale habitat and distribution population monitoring for the mountain quail; hence, the early and mid seral coniferous forest effects analysis for the Sugar Pine Adaptive Management Project must be informed by both habitat and distribution population monitoring data. The sections below summarize the habitat and distribution population status and trend data for the mountain quail. This information is drawn from the detailed information on habitat and population trends in the SNF Bioregional MIS Report (USDA Forest Service 2008), which is hereby incorporated by reference.

Habitat Status and Trend

There are currently 546,000 acres of early seral and 2,766,000 acres of mid seral coniferous forest (ponderosa pine, Sierran mixed conifer, white fir, and red fir) habitat on National Forest System lands in the Sierra Nevada. Within the last decade, the trend for early seral is slightly decreasing (from 9% to 5% of the acres on National Forest System lands) and the trend for mid seral is slightly increasing (from 21% to 25% of the acres on National Forest System lands).

Population Status and Trend

The mountain quail has been monitored in the Sierra Nevada at various sample locations by hunter survey, modeling, and breeding bird survey protocols, including California Department of Fish and Game hunter survey, modeling, and hunting regulations assessment (CDFG 2004a, CDFG 2004b) and 1968 to present – BBS routes throughout the Sierra Nevada (Sauer et al. 2007). These data indicate that mountain quail continue to be present across the Sierra Nevada, and current data at the rangewide, California, and Sierra Nevada scales indicate that the distribution of mountain quail populations in the Sierra Nevada is stable.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale Mountain Quail Trend

The 8,171 acres of early and mid seral coniferous habitat that exists within the cumulative effects boundary account for 1.5% of the 546,000 acres that exists at the bioregional scale. The change in canopy closure of 46 acres out of 809,000 acres of early and mid seral coniferous habitat in the Sierra Nevada bioregion will not alter the existing trend in the habitat, nor will it lead to a change in the distribution of mountain quail across the Sierra Nevada bioregion.

Snags in Green Forest Ecosystem Component (Hairy woodpecker)

Habitat/Species Relationship

The hairy woodpecker was selected as the MIS for the ecosystem component of snags in green forests. Medium (diameter breast height [dbh] between 15 to 30 inches) and large (diameter breast height greater than 30 inches) snags are most important. The hairy woodpecker uses stands of large, mature trees and snags of sparse to intermediate density; cover is also provided by tree cavities (CDFG 2005). Mature timber and dead snags or trees of moderate to large size are apparently more important than tree species (Siegel and DeSante 1999).

Project-level Effects Analysis – Snags in Green Forest Ecosystem Component

Current Condition of the Habitat Factor(s) in the Project Area

Prior to 2004, the forest implemented standards and guidelines (S&Gs) from the Sierra NF LRMP (USDA-FS 1991) which called for maintaining an average of 1.5 snags per acre in sizes 15 to 24-inch dbh and an average of 0.5 snags per acre in sizes 25-inch dbh or greater. All countable snags had to be 20 feet or greater height (S&G #64, p. 4-16). Additionally, a sufficient number of live trees had to be left in appropriate sizes to serve as replacement snags. The Sierra Nevada Forest Plan Amendment (SNFPA) (2004), modified the Sierra NF LRMP with the followings guidelines: (1) in westside mixed conifer and ponderosa pine types, Forests should maintain 4 of the largest snags per acre, (2) in red fir forest type, they should maintain 6 of the largest snags per acre, (3) in eastside pine and mixed conifer forest types, they should maintain 3 of the largest snags per acre, and (4) in westside hardwood ecosystems, they should maintain 4 of the largest snags (hardwood or conifer) per acre, or if standing live hardwood trees lack dead branches, they should maintain 6 of the largest snags per acre (S&G #11, p. 51).

Current conditions within the project boundary meet and in many areas exceed the snag and down woody material retention guidelines laid forth in the 2004 SNFPA. The following standards and guidelines for Snags and Down Woody Material apply to this project (USDA-FS 2004, Pg. 51-52).

Alternative 1 – No Action

Direct and Indirect Effects to Habitat

There would be no direct effects to snags in green forest habitat under this alternative. There is a potential for indirect effects under the No Action Alternative as the continued immediate threat of wildfire would remain unabated. In failing to make an attempt at density management of the stands, the eventual changes through drought stress and subsequent insect and disease mortality acceleration would exacerbate the threat of stand replacing fire. Such a wildfire would convert current snags in green forest habitat to snags in burned forest habitat. Additionally, the high probability of a drying climate change throughout the Western United States would have the potential to further compound these effects (USDA Forest Service 2009a, 2009c, 2009d).

Cumulative Effects to Habitat in the Analysis Area and Conclusion

Past, present, and reasonably foreseeable actions within the 12 sub-watershed cumulative effects boundary are displayed in Table 3 of this document, referenced from the Sugar Pine Adaptive Management Project Environmental Impact Statement (USDA-FS 2009a). Under Alternative 1 the Sugar Pine Project would not be implemented. The immediate effect of wildfires would convert current snags in green forest habitat to snags in burned forest habitat.

There is a total of 12,015 acres of mid and late seral forest habitat that provides the green forest snag component within the cumulative effects boundary. These habitat types constitute 73% of the total available habitat in the cumulative effects boundary. Many of the ongoing management activities within the cumulative effects boundary do not contribute to significant cumulative impacts upon mid and/or late seral forest habitat. Of the cumulative effects actions elevated within the analysis area private land residential development, roadside hazard tree removal, on-going plantation maintenance, and past and future timber sale activity have the greatest potential to alter snags within mid and late seral coniferous habitat.

It is possible that a small percentage of snags may be removed as residential construction continues within the cumulative effects boundary. It is reasonable to assume that all of the roadside hazard trees are snags in varying stages of decay. Roadsize hazard tree removal is slated for 41 miles of road within the cumulative effects boundary. However, only trees that are a public safety hazard (ROD Appendix A page 29) and up to a potential maximum distance of 300 feet on either side of the road are slated for removal (US Forest Service 2006b). This removal of public safety hazard trees along linear features is not expected to bring the available snag levels within the proposed project area below the current standards set forth in the ROD.

Alternative 2 – Proposed Action

Direct, Indirect, and Cumulative Effects to Habitat and Conclusion

There would be minimal direct effects to snags under the Alternative 2 proposed action. No snags are proposed for removal by any of the Action alternatives in the Sugar Pine Adaptive Management Project, except where they constitute a safety concern. Current conditions within the project boundary and cumulative effects boundary meet and in many areas exceed the snag and down woody material retention guidelines laid forth in the 2004 SNFPA. It is reasonable to assume that a few stage 4 through 7 snags may be lost in prescribed fire treatment areas, however this treatment is also likely to produce stage 2 and 3 snags. It is not expected that removal of snags that pose a safety concern along roadways or in treatment units will alter the available snag levels below the current standards set forth in the ROD.

Alternative 3

Direct, Indirect, and Cumulative Effects to Habitat and Conclusion

The proposed treatments for forest snags within Alternative 3 are the same as for Alternative 2, therefore the direct, indirect, and cumulative effects for Alternative 3 would be the same as those discussed under the Proposed Action.

Alternative 4

Direct, Indirect, and Cumulative Effects to Habitat and Conclusion

The proposed treatments for forest snags within Alternative 4 are the same as for Alternative 2, therefore the direct, indirect, and cumulative effects for Alternative 4 would be the same as those discussed under the Proposed Action.

Summary of Hairy Woodpecker Status and Trend at the Bioregional Scale

The Sierra NF LRMP (as amended by the SNF MIS Amendment) requires bioregional-scale habitat and distribution population monitoring for the hairy woodpecker; hence, the snag effects analysis for the Sugar Pine Adaptive Management Project must be informed by both habitat and distribution population monitoring data. The sections below summarize the habitat and distribution population status and trend data for the hairy woodpecker. This information is drawn from the detailed information on habitat and distribution population trends in the SNF Bioregional MIS Report (USDA Forest Service 2008), which is hereby incorporated by reference.

Ecosystem Component Status and Trend

The current (based on 2001-2004 inventory sources) average number of medium-sized and large-sized snags (≥ 15-inch dbh, all decay classes) per acre across major coniferous and hardwood forest types (westside mixed conifer, ponderosa pine, white fir, productive hardwoods, red fir, eastside pine) in the Sierra Nevada ranges from 1.4 per acre in eastside pine to 8.3 per acre in white fir. Detailed information by forest type, snag size, and snag decay class can be found in the SNF Bioregional MIS Report (USDA Forest Service 2008).

Data from the mid-to-late 1990s were compared with the current data to calculate the trend in total snags per acre by Regional forest type for the 10 Sierra Nevada national forests and indicate that, during this period, snags per acre increased within westside mixed conifer (+0.80), white fir (+1.98), and red fir (+0.68) and decreased within ponderosa pine (-0.17), productive hardwoods (-0.17), and eastside pine (-0.16).

Population Status and Trend

The hairy woodpecker has been monitored in the Sierra Nevada at various sample locations by avian point counts and breeding bird survey protocols, including 1997 to present – Lassen National Forest (Burnett and Humple 2003, Burnett et al. 2005); 2002 to present – Plumas and Lassen National Forests (Sierra Nevada Research Center 2007); 1992 to 2005 – Sierra Nevada Monitoring Avian Productivity and Survivorship (MAPS) stations (Siegel and Kaschube 2007); and 1968 to present – BBS routes throughout the Sierra Nevada (Sauer et al. 2007). These data indicate that the hairy woodpecker continues to be present at these sample sites, and current data at the rangewide, California, and Sierra Nevada scales indicate that the distribution of hairy woodpecker populations in the Sierra Nevada is stable.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale Hairy Woodpecker Trend

The 12,015 acres of mid and late seral forest habitat that provides the green forest snag component within the cumulative effects boundary account for less than 1% of the 3,835,000 acres of mid and late seral coniferous forest habitat within the Sierra Nevada bioregion. Therefore, none of the alternatives would alter the bioregional trend in the snag component of the coniferous forest habitat, nor would they lead to a change in the distribution of the hairy woodpecker across the Sierra Nevada bioregion.