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Wildlife Biological Evaluation Report

Westside Fire Recovery Project

Happy Camp/Oak Knoll and Salmon/Scott River Ranger Districts
Siskiyou County, California

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Biological Evaluation Report

Introduction

The purpose of this document is to evaluate effects of the Westside Fire Recovery project (project) on habitat of Forest Service Region 5 sensitive species which may be in the project area. This Biological Evaluation (BE) follows standards established in Forest Service Manual direction (FSM 2672.42; USDA Forest Service 1991) and complies with National Forest Management Act (NFMA), National Environmental Policy Act (NEPA) and 1995 Land and Resource Management Plan (Forest Plan) for the Klamath National Forest (Forest). Based on the effects of the proposed activities, this analysis determines whether these activities will lead the Forest Service Sensitive Species in a trend towards Federal listing (FSM 2672.41).

In addition, the northern spotted owl, although a threatened species under the Endangered Species Act which is analyzed in the biological assessment (BA), the BA only covers one alternative in the analysis. In order to present the effects for all alternatives (Forest Plan pg. 4-27 and FSM 2671.2), this BE contains an analysis for the northern spotted owl.

- Northern spotted owl

The USDA Pacific Southwest Region sensitive species list (File Code 2670; USDA Forest Service, Forest Sensitive Species list revised July 3, 2013) were considered for this analysis.

- Bald eagle (*Haliaeetus leucocephalus leucocephalus*)
- Northern goshawk (Accipter gentiles)
- Willow flycatcher (Empidinax traillii)
- *Greater sandhill crane (Grus canadensis tabida)
- *Great gray owl (Strix nebulosa)
- North American wolverine (Gulo gulo luteus)
- Fisher (Pekania pennanti)
- Pallid bat (Antrozous pallidus)
- Townsend’s big-eared bat (Corynorhinus townsendii)
- Fringed myotis (Myotis thysanodes)
- Pacific marten (Martes caurina)
- Siskiyou Mountains salamander (Plethodon stormi)
- [1]Cascade frog (Rana cascadae)
- [1]Northern red-legged frog
- [1]Foothill yellow-legged frog (Rana boylii)
- [1]Southern torrent salamander (Rhyacotriton variegates)
- Tehama chaparral snail (Trilobopsis tehamana)
- Western bumble bee (Bombus occidentalis)

(*) The great gray owl and greater sandhill crane are not likely to occur in the project area and the project area is outside the species range. Therefore, this project will have no effect on great gray owl and greater sandhill crane and these species will not be further considered in this BE.
([1]) These species will be evaluated in the fisheries report.

Proposed Actions and Alternatives Analyzed

For a detailed description of the alternatives considered for this analysis, please see Chapter 2 of the project EIS.

Methodology

Methodology for the analysis included field review, review of the latest scientific research and literature, GIS analysis, and local expertise for the consideration of direct, indirect and cumulative effects. The *Treatment Units* boundaries reflect the physical project footprint, where proposed vegetation and prescribed fire would occur. The *Project Area* is represented by the legal descriptions within which treatments are proposed and described in the project EIS. The *Analysis Area* represents the area that could be directly and indirectly affected by the action.

<u>Sensitive Species selected for analysis</u>

The Region 5 Sensitive Species list (File Code 2670; USDA Forest Service, Forest Sensitive Species list revised July 3, 2013) provided the species to consider for this analysis. Species were assessed for whether the species range overlapped the project area and habitat is likely to exist in the project area. If both were true, then the species is analyzed for the project.

Known locations of Forest Service Sensitive Species were identified from the Natural Resource Information Systems database (NRIS) and the California Natural Diversity database (CNDDB). Habitat analysis used EVEG 2007 database (Remote Sensing Data) (for vegetation prior to the wildfire), in conjunction with aerial photography (using the 2009/2010 and 2012 National Agricultural Imagery Program (NAIP) imagery), field verification, remotely sensed data for burned vegetation (Rapid Assessment of Vegetation condition, RAVG) and knowledge and expertise of district and forest personnel. Field reconnaissance of habitat conditions was conducted during the fall of 2014.

Rapid Assessment of Vegetation Condition (RAVG) after wildfire and habitat data

For the post-fire assessment of habitat, we used Rapid Assessment of Vegetation Condition after wildfire (RAVG) data to estimate the level of fire effects to habitat. RAVG is a vegetation burn severity modeling approach to assess the change in vegetation condition. The RAVG data shows the tree basal area loss due to fire throughout the burned area. Therefore, in any given spot in the fire perimeter, we can estimate the fire effects to the vegetation using the RAVG level of basal area loss. For this analysis the RAVG data was split into five classes. We interpreted these five classes into no burn (0%), very low (>0-25%), low (25-50%), moderate (50-75%), and high (75-100% basal area loss) to represent the fire severity.

Using the RAVG data and the habitat GIS data, we can identify each area of habitat with a specific level of basal area loss using RAVG. Then we compared the GIS habitat layer and RAVG accuracy through multiple field visits in 2014 and 2015. The field review resulted in determining these data were sufficient for estimating the potential effects of the project.

Forest Plan Guidance

One of the primary purposes of the Forest Plan is to guide land management through the adherence to the Forest-wide and management area standards and guidelines. The desired condition represents the general goal for which the project the project will strive for. Forest Plan standards and guidelines (both forest-wide and specific to management areas) were developed to assure compliance with law, regulation and policy and to minimize impacts during Forest Plan implementation. Forest Plan implementation is accomplished through site-specific projects. Information from the Forest Plan that is pertinent to Forest Sensitive Species occurring in the Westside Fire Recovery project is displayed below; this information was used in developing analysis indicators.

Forest Sensitive Species Determination

Forest Sensitive Species are plant and animal species identified by a Regional Forester for which population viability is a concern. This concern is based on 1) a significant current or predicted downward trends in population numbers or density and 2) a significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution (FSM 2672.1).

Forest management should develop and implement management practices to ensure that species do not become threatened or endangered because of Forest Service actions. The desired objective should be to maintain viable populations of all native and desired nonnative wildlife, fish, and plant species in habitats distributed throughout their geographic range on National Forest System lands. Develop and implement management objectives for populations and/or habitat of sensitive species (FSM 2670)

The primary goal of forest management is to avoid or minimize impacts to species whose viability has been identified as a concern. However, if impacts cannot be avoided, the Forest will analyze the significance of potential adverse effects on the population or its habitat within the area of concern and on the species as a whole. The Forest Representative, with project approval authority, makes the decision to allow or disallow impact, but the decision must not result in loss of species viability or create significant trends toward Federal listing.

A viable population can be described with the number and distribution of reproductive individuals that would insure its continued existence. However, because species and their environments are dynamic, it is not possible to insure that a species will persist indefinitely. Likewise, there is not a single, fixed size of a population above which a species is viable and below which it will become extinct (Boyce 1992). Consequently, viability is best expressed through varying levels of risk.

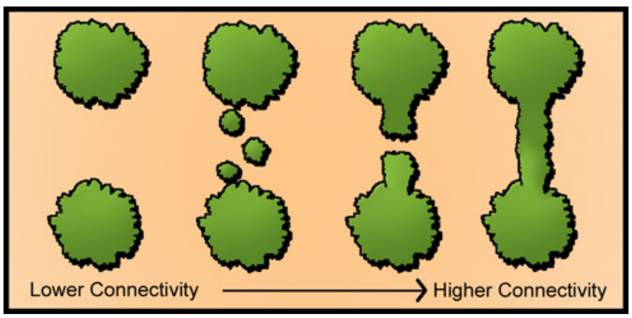
There are several factors affecting wildlife populations that can be assessed through risk. Survival and reproduction are the primary factors of population dynamics which can be affected by several direct and indirect stressors. For example, the amount and distribution of habitat and associated resources is a common risk factor of population growth. If the individuals of a population cannot find food, water, and shelter to survive and reproduce, then the population will decline. Directly measuring survival and reproduction is difficult, but the change in habitat quality or habitat connectivity can be used as a proxy to assess a general population trend.

Therefore, the Forest Sensitive Species assessment is a structured and reasoned series of judgments about projected amounts and distributions of habitat and the likelihood that such habitat would allow populations of species that may be at risk to remain well-distributed over the long-term. The resulting analysis will provide an estimate of effects to determine whether the proposed activities will lead to a Forest Sensitive Species towards a trend to being listed.

Habitat Connectivity

Habitat connectivity is used to describe the spatial arrangement of habitat which aids in estimating the likelihood of individuals moving across the landscape. Connectivity can be technically defined as the degree to which a landscape facilitates or impedes wildlife movements among patches of habitat (Taylor et al. 1993). Connecting patches of habitat can benefit a species by providing access to other areas of habitat thus increasing gene flow and population viability, and opportunity to colonize unoccupied areas of habitat. The desired condition for connectivity is ample habitat that an animal can travel through to reach large patches of habitat while providing enough cover to avoid predation (Figure 1). Given the natural variation in landscape arrangement of habitat, large patches of habitat are commonly connected by a series of small habitat patches or a fully connected narrow piece of habitat. Without connectivity, wildlife movements can be inhibited possibly affecting individual's movements or possibly isolate a population. Isolated populations can suffer from a series of negative effects over time which can ultimately affect the population viability. Figure 1displays the varying quality of habitat connectivity; higher connectivity increases the likelihood of a species moving from one large habitat patch to another. Higher habitat connectivity is the desired condition.

Figure 1. Basic design of habitat connectivity between patches of habitat



Credit: USDA Agroforestry Center

The California Department of Transportation (Caltrans) and California Department of Fish and Wildlife (CDFW) commissioned the California Essential Habitat Connectivity Project to identify a functional network of connected habitat for wildlife species and reduce the conflict between vehicle and wildlife collisions (Spencer et al. 2010). The report displays a statewide Essential Habitat Connectivity Map is a coarse scale map depicting the blocks of habitat important for maintaining connectivity over a large area. These habitat blocks were designed to inform large scale land management efforts, but these blocks were intended to be replaced by more detailed analyses (Spencer et al. 2010). The Westside Fire Recovery project contains portions of the identified Essential Habitat Connectivity area.

Theobald et al. (2011) found similar importance of the Westside Fire Recovery project area for contributing to large scale wildlife connectivity as the California Essential Habitat Connectivity project. However, the authors claim their approach offers more advantages to identifying important connectivity. Regardless, this approach like the California Essential Habitat Connectivity Project is coarse in scale and doesn't provide the detail to determine the change in connectivity at a smaller scale (e.g. 7th field watershed). Therefore, using either approaches for the Westside Project would not result in a sensitive analysis to accurately display difference in effects between alternatives.

Analysis Indicators

The following analysis indicators were developed using the Forest Plan Standards and Guidelines and the best available science to estimate the direct, indirect, and cumulative effects for each Forest Sensitive species and northern spotted owl analyzed in this project.

Table 1. Forest Service Sensitive (FSS) Species and northern spotted owl analyzed for this project and the corresponding analysis indicator

T&E Species	Analysis Indicator
Northern spotted owl	• Risk to reproduction • Change in critical habitat
FSS Species	Analysis Indicator
Bald eagle	• Level of disturbance to nest sites • Risk to future potential nest trees
Northern goshawk	• Level of disturbance to nest site • Risk to reproduction
Fisher, Marten, and Wolverine	• Level of habitat connectivity • Change in fisher home range
Pallid bat, Townsend's big-eared bat, and Fringed myotis	• Risk of disturbance
Willow flycatcher	• Level of habitat alteration
Siskiyou mountain salamander	• Risk of habitat disturbance
Tehama chaparral snail	• Risk of habitat disturbance
Western bumble bee	• Level of habitat disturbance

Northern spotted owl (NSO)

<u>NSO Habitat types</u>

A description of NSO nesting/roosting, foraging, and dispersal habitat is available in the BA.

Analysis Indicator #1 – Risk to reproduction

Reproduction is one of the primary elements of a species existence and effects to reproduction can have a significant effect on any population. The amount of suitable habitat within both the home range and core has been shown to influence NSO productivity and survivorship (Bart 1995, Franklin et al. 2000, Dugger et al. 2005). Based on results of these studies, the USDI Fish and Wildlife Service has concluded that significant effects to reproduction are not likely to occur if management activities retain a higher proportion (at least half, or 250 acres) of the core area's high quality habitat and 1,086 acres of suitable habitat in the home range (outside the core) (USDI Fish and Wildlife Service 2009). Core areas falling below these habitat acre levels may affect the productivity and survival of NSO. Older forest is more likely than other vegetation classes to provide NSO with suitable structures for perching and nesting, a stable, moderate microclimate at nest and roost sites, and visual screening from both predators and prey.

Recent research has argued the value of fire affected nesting, roosting, and foraging habitat in NSO activity centers (Bond et al. 2009, Roberts et al. 2011, Lee et al. 2012, and Lee et al. 2013). The research indicates variability and a high level of uncertainty in the degree to which spotted owls use post-fire landscapes, but the research does suggest that fire affected habitat could be used for foraging, but not nesting. Despite these uncertainties and the fact that fire affected NSO habitat doesn't meet the described habitat characteristics in the 2011 NSO Recovery Plan, 2012 NSO Revised Critical Habitat Rule, or many other research documents, fire affected habitat will be assessed within the NSO activity center as potential foraging opportunity. A detailed discussion and review of the literature concerning NSO use of fire affected forest is available in the Biological Assessment.

This analysis will calculate the change in NSO habitat (nesting/roosting, foraging, or dispersal habitat) within the nesting core and home range resulting from all alternatives. The changes in NSO habitat will be analyzed and compared to the suggested levels of habitat as described by the USFWS (USDI FWS 2009), published research, and professional judgement.

Assumptions

- Occupancy and reproduction success is solely based on the amount and quality of habitat in the activity center
- Habitat burned at low (<50% basal area removed per RAVG data) severity will still function as it did pre-fire
- Pre-fire nesting/roosting and foraging habitat that burned at moderate severity (50-75% basal area removed) will not function at its pre-fire habitat type.
    - Nesting/roosting will become foraging habitat
    - Foraging habitat will become post-fire foraging area (PFF)
- PFF may contribute to the success of NSO reproduction in the short-term (as long as the snags remaining standing) for ACs with few acres of suitable habitat, but PFF will not be part of the criteria of this analysis because the research doesn't provide a clear understanding on how PFF contributes to satisfying nesting NSO needs.
- Roadside treatment in existing NSO habitat will result in degrading habitat thus habitat will remain functioning at the current habitat type after treatment.
- Roadside plus fuels treatment in existing NSO habitat will result in downgrading habitat thus habitat will drop down one habitat type level. For example, an area of nesting/roosting habitat that receives a roadside and fuels treatment will result in this area becoming foraging habitat after treatment.
- Several salvage harvest units contain existing suitable NSO, but the habitat will not be salvaged. The habitat may receive a fuels treatment that will result in a habitat degrade, but not a downgrade or removal.
- Landing construction will result in the loss of habitat for the footprint of the landing.

Spatial and Temporal Bounds

For known NSO territories, NSO habitat will be evaluated at two spatial scales: 1) home range and 2) core areas (see BA for description of habitat). Based on the median home range estimate for NSO pairs in the Klamath Province, we are using a 1.3 mile radius home range and 0.5 mile radius core for evaluating habitat conditions of and potential impacts to home ranges and core around the nest location (Thomas et al. 1990, USDI Fish and Wildlife Service 1992, 2009). The core and home range analysis will be limited to the home ranges that overlap the fire perimeter. Therefore, the spatial bound is the home ranges that intersect the fire perimeter plus the entire project area.

The effects analysis temporal bounding is presented as short-term and long-term. The short-term (5 years) will cover the time during implementation and the period of time when the majority of the snags will likely remain standing. The long-term (>10 years) will include the time when the snags will likely start falling resulting in changes to the physical structure.

Criteria for assessing risk to NSO reproduction

The amount of NSO habitat will be assessed for all known activity centers and these acres of habitat will be interpreted into four categories based on the criteria below (table 2).

Table 2. Criteria used for NSO risk to reproduction analysis indicator

Risk to Reproduction	Criteria*
Very Low	• In the core, >400 acres of NRF (≥250 NR must occur in the core), AND • In the home range, >935 acres of NRF
Low	• In the core, >250 acres being NRF, AND • In the home range, >1,086 acres NRF
Moderate	• In home range, 665 to 1,336 acres of NRF
High	• In home range, <665 acres of NRF

*Core – 0.5 mile radius from the center of the activity center. Home range – 0.5 to 1.3 mile radius from the center of the activity center.

Risk to reproduction is split into four categories representing the relative levels of effects resulting from the alternatives. Using the existing quality and amount of habitat within the Activity Center (composed of core and home range), the acres of NRF will be calculated as the existing condition and the AC will be placed into one of the four categories. Then each alternative’s effects on habitat will be calculated and compared to the existing condition. Note that an AC cannot have a reduction in risk. For example, an AC that meets the conditions of moderate given the existing habitat condition can only remain as moderate or increase to high risk based on the actions of each alternative. However, an AC currently at high risk will continue to be at high risk regardless of the level of effects resulting from each alternative.

A high risk means that reproduction is not likely to occur in the AC because the low number of habitat acres occurring in the core and home range. Moderate level represents the ACs that are likely to have difficulty in finding resources and will likely need to transverse openings (areas without overstory tree canopy) or use areas of low habitat quality to find enough resources. These challenges may result in lower survival or reproduction potential for the pair occupying moderate level ACs. However, moderate level ACs may shift to high risk regardless of this project because of delayed tree mortality. Delayed tree mortality may reduce the amount of tree canopy that would result in current habitat being reduced to unsuitable habitat. However, for this analysis, habitat is assessed based on the current conditions and not on potential delayed tree mortality. Low level ACs have enough habitat in the core and home range to support reproduction, but the habitat may not be distributed in large patches. Generally, many of the active ACs on the Forest can be described as containing similar amount of habitat as described for the “low” level category. The final category, very low, represents the quality and distribution habitat that has been associated with successful reproduction over the species range, but these conditions are not common on the Forest typically because the patches of NR are relatively small and are spatially separated.

Analysis Indicator #2 – Changes to Critical Habitat

Critical habitat analysis is focused on potential effects to the biologically important features (primary constituent elements) used to identify critical habitat. Only changes to the Primary Constituent Elements as a result of proposed actions will be analyzed by estimating the number of acres and PCE affected for each alternative. More information on NSO critical habitat is available in the project Biological Assessment.

Assumptions

- All NSO habitat that burned at high severity (75-100% basal area loss) is longer suitable habitat
- Nesting/roosting habitat that burned at moderate severity (50-75% basal area loss) was downgraded to foraging habitat
- Foraging habitat that burned at moderate severity became unsuitable habitat
- Roadside treatment in existing NSO habitat will result in degrading habitat thus habitat will remain functioning at the current habitat type after treatment.
- Roadside plus fuels treatment in existing NSO habitat will result in downgrading habitat thus habitat will drop down one habitat type level. For example, an area of nesting/roosting habitat that receives a roadside and fuels treatment will result in this area becoming foraging habitat after treatment.
- Several salvage harvest units contain existing suitable NSO, but the habitat will not be salvaged. The habitat may receive a fuels treatment that will result in a habitat degrade, but not a downgrade or removal.
- Landing construction will result in the loss of habitat for the footprint of the landing.

Spatial and Temporal Bounds

The spatial bound is the critical habitat that occurs in the analysis indicator 1 analysis area. The temporal bounds will be the same as Analysis Indicator 1.

Criteria for assessing NSO Critical Habitat analysis

The analysis will estimate the number of critical habitat acres affected by each alternative. Please note that fire affected foraging habitat is still a point of disagreement in the literature and for the purpose of this analysis, it will not be discussed. Given the types of treatment proposed for this project that will likely maintain the habitat or remove habitat, we focus the reporting of effects on habitat as downgraded or removed. Habitat removal means the habitat prior to treatment will no longer function as NSO habitat after treatment.

The acres of critical habitat downgraded or removed by each alternative will be presented along with the proportion of the change in critical habitat within the portion of critical habitat subunit within the analysis area.

Bald Eagle

Bald eagles generally nest near rivers, large lakes or streams that support an abundant food source. Eagles have been recorded to nest in a variety of natural and manmade structures but most often nest in mature trees or snags. The nest tree or snag is typically the tallest tree with strong limbs that can support the heavy nest. Nest sites also include a perch that is near the nest but in sight of water where the eagles would forage. Given the specific needs of an eagle needs, nest trees are a rare resource and should be conserved.

During the reproductive period (January1 to August 1), eagles are sensitive to human activities. Eagles appear to be most sensitive during the beginning part of nesting - nest building through incubation (December through May). However, each eagle pair can respond to disturbance differently. Some pairs have been recorded to nest successfully just yards from human activity (e.g. along roads) while other pairs may abandon their nest in response to human activities much further away. The variability may be related to a number of factors: visibility of the disturbance, duration of the disturbance, noise level, extent of the area affected by the activity, prior experiences with humans, and tolerance of the nesting pair.

During the nesting period, human activity can also disrupt eagle roosting or foraging which can result in negative affects to nesting. Disruptive activities that result in interfering with eagle foraging can increase the time it takes for a parent to find food and feed the chicks. This could result in the chicks not receiving enough food.

The US Fish and Wildlife Service (USFWS 2007) has developed a series of management recommendations to minimize effects on bald eagles. The USFWS recommended 1) keep a distance from nest sites, 2) maintain landscape buffers between the nest and the activity, and 3) avoid certain activities during the reproductive period. The size and shape of the buffer around nest sites depend on the activity and topographical features. Natural noise barriers like forest and mountains can reduce the visual and loudness of the activity thus reducing the disturbance. The USFWS provides general guidance and buffer distance for various activities that might disturb an eagle nest, but these buffers may need to be adjusted depending on nest location and nesting pair tolerance of activity.

USFWS recommendations for an active eagle nest (January1 to August 1):

- No loud noises (e.g. chainsaw and yarder) within 660 feet of the nest.
- No aircraft within 1,000 feet of nest site
- Avoid any potentially disruptive activities in the eagles’ direct flight path between their nest site and foraging area.

UFWS recommendations for habitat management (November 1 to March 31):

- Preserve potential roost and nest trees within 0.5 mile of large rivers or lakes.

Analysis Indicator #1 – Level of Disturbance

Disturbance of eagle nest sites can affect chick survival. The two most common activities likely to occur in this project that may disturb eagles are helicopters and noise created by equipment. Helicopters typically present loud and intermittent noise disturbance over a large area that will be visible to a nesting eagle thus they are likely to create a greater risk to nesting eagles. Equipment noise (e.g. chainsaw or yarder) can be loud when it occurs near a nest but the noise is not expected to travel far given the forested environment and topography.

Assumptions for eagle disturbance analysis

- Eagles observed within the general area of known nests are assumed to be nesting
- All eagle nests have been found in the project area
- Nesting eagles will respond to the same level of noise equally
- Noise disturbance is a function of distance from the nest site
- Roadside hazard and salvage treatment will remove habitat

Spatial and Temporal Bounds

The spatial bound is the known eagle nests plus 1,500 feet buffer. The temporal bounds for the short-term will be the time during implementation (about 5 years) during the reproductive (January1 to August 1) and roosting period (November 1 to March 31) and long term will be 10 years.

Criteria for assessing eagle disturbance

The desired condition is a low level of disturbance to eagle nests. The level of disturbance appears to be related to the distance from a nest site. Loud noises further from the nest site should have lower disturbance than the same noise closer to the nest. Disturbance will be assessed as a distance from the known nest sites. Any treatment unit that overlaps the buffers presented below (table 3) will be given a level of disturbance

Table 3. Criteria for eagle disturbance analysis indicator

Level of Disturbance	Distance from nest site
High	<1,000 feet of nest site
Moderate	1,000 – 1,500 feet of nest site
Low	>1,500 feet of nest site

For this analysis, a high level of disturbance would likely result in an eagle pair abandoning the nest. Moderate level of disturbance would result in the adults leaving the nest for a short period of time and may result in delayed feeding of young or not incubating the egg(s). Low level of disturbance may result in the adult eagles displaying behavior of acknowledging the human activity, but the adults continue to incubate the egg(s) or feed offspring.

Analysis Indicator #2 – Risk to future nest trees for known eagle nest sites

Bald eagles usually build nests on prominent features in the landscape that overlook aquatic foraging area typically within stands of mature and old-growth forest (Anthony et al. 1982). However, eagles have been documented to build nests in a variety of tree species and in California and Oregon, nests are most often found in large ponderosa pine (diameter at breast height of >40 inches) (Anthony et al. 1982). Nest trees are typically used for many years, but nest trees do fail at some point and another nest tree will be needed or an alternate nest may be used. Alternate nest is a nest that is not used for a given breeding season, but the longer an alternate nest goes unused, the likelihood of the nest being used decreases over time. Alternate nest or a new nest is usually occupied within one mile of the former nest site but topographic features should be considered when determining the area an alternate nest may occur because nests are typically contained within a single drainage (Anthony and Isaacs 1989).

For land management, the National Bald Eagle Management Guidelines (2007) recommends no removal of overstory trees within 330 feet of the nest tree and to protect and preserve potential nest sites by retaining mature trees within 0.5 mile from water. The Forest Plan uses a nest protection zone for the area up to 0.5 mile around a nest site to identify the area that may influence nesting conditions (pg. 4-90). The average distance for known eagle nests along the Klamath River (portion within the Forest) is 0.23 mile.

Assumptions for risk to future nest trees for known nest sites

- All eagle nests have been located in the project area
- All nesting habitat within the analysis area has equal distribution and quality of potential nest trees
- Nest tree selection is contained within the analysis area (see below in spatial and temporal bounds section).
- Roadside hazard and salvage treatments will remove the size class trees that may provide for future nest trees.

<u>Criteria for assessing risk to future nest trees for known eagle nests</u>

The desired condition is a low level of risk to potential future nest trees. Eagles in the project area have nested in the same drainage for many years, but these drainages typically contain only a few trees that meet the physical requirements for supporting a nest. Trees that meet the characteristics of potential future nest trees typically occur in dense mature forest or somewhat isolated individuals.

Spatial and Temporal Bounds

The spatial bounds for selecting the eagle nests for this analysis are those nests within the project area plus 0.5 mile buffer and the area between the buffer and the river. This bounding will provide an analysis area for each nest by encompassing the nest tree and the area likely to contain a future nest tree. The temporal bounds for the short-term will be the time during implementation (about 5 years) and long term will be 10 years.

Table 4. Criteria for risk to future nest trees for known eagle nests analysis indicator

Level of Risk	Criteria

Low	<10% removal of nesting habitat
Moderate	≤10 - 25% removal of nesting habitat
High	>25% removal of nesting habitat

A low level of risk to future nest trees will result in a distribution of potential nest trees that will likely provide ample opportunity for a new nest site. Moderate level of risk will result in fewer potential nest trees. High level of risk may result in the eagle possibly not finding another nest tree within the near area of the current nest tree thus the eagles may need to leave the drainage.

Northern Goshawk

Goshawks are commonly associated with high canopy closure, large trees, canopy layering and abundant coarse woody debris. Goshawks typically nest in a patch (20-50acres in size) of dense forest canopy (>50%) and large trees (>20in dbh) (Daw and DeStefano 2001). Generally, goshawks foraging areas in forested habitat with ≥40% canopy cover (Greenwald et al. 2005), but in California, goshawks may forage in areas with less canopy cover (average 34%, Hargis et al. 1994). Goshawks appear to select forested areas with larger trees; Good (1998) found goshawks foraged in lodgepole with a greater abundance of trees with >9in dbh and Hargis et al. (1994) found a greater abundance of trees with >16in dbh in foraging areas.

The Forest Plan provides Standards and Guidelines (page 4-29) for goshawk management which was written prior to some of the research presented above thus some of the measures are not the same. However, for the purposes of this analysis, we are using the recommendations from the Forest Plan.

Analysis Indicator #1 – Level of Disturbance

Little information is available about the direct effects of disturbance on nesting goshawks. However, goshawks generally exhibit a high level of vulnerability during the incubation stage. In Wales, logging and roadbuilding were identified as the possible reason for five nest failure that were within 60 meters of the disturbance (Toyne 1997). The Forest Plan standards and guidelines recommend a noise disturbance buffer of 0.25 mile buffer around nest sites (pg. 4-29).

Assumptions for eagle disturbance analysis

- Known nests are assumed to be active
- All nests have been found
- Nesting goshawk will respond to the same level of noise equally
- Noise disturbance is a function of distance from the nest site

Spatial and Temporal Bounds

The spatial bound is a 0.25 buffer around known nest sites. The short-term temporal bound is the time including implementation (about 5 years), but only during the annual reproductive period (March 1 to August 31). The long-term temporal bound is 10 years.

<u>Criteria for assessing goshawk disturbance</u>

The desired condition is a low level of disturbance to goshawk nests. The level of disturbance appears to be related to the distance from a nest site. Loud noises further from the nest site should have lower disturbance than the same noise closer to the nest. Disturbance will be assessed as a distance from the known nest sites. Any treatment unit that overlaps the buffers presented below (table 4) will be given a level of disturbance.

Table 5. Criteria for goshawk disturbance analysis indicator

Level of Disturbance	Distance from nest site
High	<500 feet of nest site
Moderate	500ft - 0.25 mile of nest site
Low	>0.25 mile of nest site

Low level of disturbance means that the nesting goshawk will likely not respond to the noise thus the noise will likely not reduce the likelihood of the success of the nest. Moderate level of disturbance will likely result in one of the adults alarm calling and possibly fly toward the noise thus reducing the time spent foraging to feed the offspring. A high level of disturbance will likely result in both adults moving towards the disturbance and displaying aggressive behavior. High level of disturbance will likely result in the nest being abandoned.

Analysis Indicator #2 – Risk to reproduction

The amount and quality of nesting habitat can affect the success of a nest. The Forest Plan recommends that management in the goshawk primary nest zone (0.5 mile radius around nest site) maintain at least 60% canopy cover over 300 acres (primary nest zone equals 504 acres). The remaining 204 acres in the primary nest zone should contain a mosaic of forested conditions. In addition, a foraging habitat zone (1 mile radius of the nest site but excludes primary nest zone) should maintain 60% of this area in a mosaic of stand conditions with the remaining portion possibly containing openings or low level of canopy cover (Forest Plan pg. 4-29).

Assumptions for eagle disturbance analysis

- High fire severity affected goshawk habitat will not function as habitat
- Nest sites below the described amount of habitat in the “high” level of risk are no longer occupied
- Level of risk categories presented below accurately represent the effects to goshawk nesting success
- Roadside hazard and salvage will remove habitat

Spatial and Temporal Bounds

The spatial bound is known nest sites (1 mile buffer) in the project area. The short-term temporal bound is the time including implementation (about five years) and the long-term temporal bound is 10 years.

<u>Criteria for assessing the risk to goshawk reproduction</u>

The desired condition is a low level of risk to reproduction. A small amount of habitat or a reduction in habitat quality can influence the success of nest or the future occupancy of the nest. However, there is no minimum level of habitat to describe the point where a nest will no longer provide the necessary resources. The recommended habitat quality and distribution in the Forest Plan provides estimates based on successful nests but this doesn't mean that nests with less habitat aren't successful.

Table 6. Criteria for risk to goshawk reproduction analysis indicator

Level of Risk	Amount of habitat
High	Primary nest zone (0.5 mile radius around nest site) • Maintain 100-199 acres of nesting habitat with ≥60% canopy cover • Maintain ≥204 acres of forested habitat with ≥40% canopy cover and small openings Foraging habitat zone (0.5 to 1.0 mile radius around nest side) • Maintain the 1,506 acres can be a mix of opening and forested age classes
Moderate	Primary nest zone (0.5 mile radius around nest site) • Maintain 200 - 299 acres of nesting habitat with ≥50% canopy cover • Maintain ≥204 acres of forested habitat with ≥40% canopy cover and small openings Foraging habitat zone (0.5 to 1.0 mile radius around nest side) • Maintain ≥900 acres of forested habitat with ≥40% canopy cover • The remaining 606 acres can be a mix of opening and forested age classes
Low	Primary nest zone (0.5 mile radius around nest site) • Maintain ≥300 acres of nesting habitat with ≥60% canopy cover • Maintain ≥204 acres of forested habitat with ≥40% canopy cover and small openings Foraging habitat zone (0.5 to 1.0 mile radius around nest side) • Maintain ≥900 acres of forested habitat with ≥40% canopy cover • The remaining 606 acres can be a mix of opening and forested age classes

A high level of risk would result in a nesting pair of goshawks not finding enough resources to successfully produce offspring and contribute to the population. A moderate risk may provide enough habitat to raise offspring, but the pair may spend more time foraging for food which may still affect nests with more than one chick. A low level of risk should provide enough habitat and diversity of habitat to find sufficient resources to produce a successful nest.

Fisher, Marten, and Wolverine

Fisher

Fisher population viability is related to the amount and quality of habitat. Fishers are strongly associated with dense, mature forest which provides the necessary food, water, shelter for reproduction and survival. Fisher use a variety of mid- to low- elevation forested types in California such as Douglas fir, mixed conifer, ponderosa pine, and mixed conifer-hardwoods (Zielinski et al. 2004). Throughout the varying tree species composition types, moderate and dense forest canopy closure appears to be an important predictor of fisher occurrence at the landscape scale (Carrol et al. 1999, Zielinski et al. 2004, Zielinski et al. 2006, Davis et al. 2007). At the stand scale, fisher habitat may have a diversity of tree sizes and species creating a closed canopy (>40%) (Zielinski et al. 2004) along with canopy gaps and associated understory vegetation and decadent structures (snags, cavities, and fallen trees) (Zhao et al. 2012, Powell and Zielinski 1994).

Tree species composition may be less important to fisher than components of forest structure which can affect foraging success and provide denning and resting sites (Buskirk and Powell 1994). Common resting structures include live trees, snags, cavities, large branches, large woody debris and mistletoe clumps, but fisher have been found using many other resting structures (Powell 1993, Zielinski et al. 2004, Yaeger 2005). Trees used for resting are usually the largest trees (typically >30 in dbh) in the fisher home range (Zeilinski et al. 2004). Denning sites are commonly associated with cavities in large live or dead trees (Powell and Zielinski 1994). Large denning trees (>30 in dbh conifer and >16 in dbh hardwood) are needed because fisher need a large cavity (>12in diameter) to provide enough space for the female fisher and young (Truex et al. 1998, Weir and Corbould 2008, Weir et al. 2012). Potential denning and resting sites can be found in younger and mid-seral forest which may contain only a few large trees with cavities, large logs, and snags (Self and Kerns 2001, Lindstrad 2006).

Juvenile fishers are capable of dispersing long distances and navigating various landscape features such as highways, rivers, and rural communities to establish their own home range (York 1996, Weir and Corbould 2008). Long distance dispersal has been documented for fishers; males move greater distances than females. Arthur et al. (1993) reported an average maximum dispersal distance of 9.3 mi and 10.7 mi for females and males, respectively (range = 4.7 mi to14.0 mi for females and 6.8 mi to 14.3 mi for males). However, dispersing individuals that traveled longer distances have a greater risk of mortality (Weir and Corbould 2008).

The dispersal distance for a fisher is likely related to habitat quality and spatial separation of habitat. Fisher can use closed canopy habitat to cross the landscape, if available, but fisher tend to avoid areas with no overhead cover likely because of the exposure to predators (Buskirk and Powell 1994). Large areas without overhead cover may create a barrier to dispersing fisher (Powell 1993, Jones and Garton 1994, Weir and Corbould 2010) and dispersing fisher may have difficulty locating and occupying distant, disjunct but suitable, habitat (Carroll et al. 2001). In general, fisher dispersal is affected by the reduction in fisher habitat and the distance between patches of habitat (Weir and Corbould 2010).

Given the uncertainty of the maximum elevation a fisher may occur on the west-side of the Forest, we are not using an elevation maximum for this analysis.

<u>Fire effects on fisher habitat</u>

Wildfires are a natural part of California's forests and given the severity, fires can dramatically affect fisher habitat. Depending on the severity and spatial distribution of the fire and the habitat prior to the fire, the level of fire effects can vary. Low severity forest fires are considered to have a beneficial effect on fisher habitat in the long-term by building fire resiliency. In the short-term, low severity fires can decrease habitat components for fisher prey species thus reducing prey abundance and availability; reduction in prey populations would affect fisher ability to find enough food within a home range (Lehmkuhl et al. 2006). Catastrophic, or stand-replacing, wildfires burn at high intensity over large areas removing forest habitat. Since fisher are dependent on dense canopy cover and late-seral forest structures for resting and denning, the loss of these important habitat components are likely to negatively affect fisher over the long-term (Powell and Zielinski 1994, Naney et al. 2012). The regeneration of forest development into large-diameter trees may require 100 or more years of growth before the trees reach the desired size.

Moderate and mixed severity fires can affect fisher habitat by removing canopy cover and important habitat components Small patches of habitat may receive moderate or mixed fire severity while leaving other patches of habitat minimally affected. Regardless of the fire severity, the loss of canopy cover greatly diminishes the potential of fisher use likely because the lack of canopy cover increases the risk of predation (Buskirk and Powell 1994, Naney et al. 2012).

Fisher use of fire affected habitat is not well understood (Hanson 2013). In southern Sierra Nevada, fisher scat was found in pre-fire dense, mature mixed conifer that was both fire effected and not fire effected (Hanson 2013). However, the study didn't provide an estimate of post-fire canopy cover which can be an important habitat component in linking fisher use with habitat conditions. In addition, forest stand complexity and physical structure can provide cover that is likely important for fisher in fire affected forests, but these attributes were not measured. Basically, the article (Hanson 2013) provided some evidence that fisher will use fire affected habitat, but the stand characteristics that may aid in explaining these observations were not explored.

Overall, fisher use of fire affected conifer forest is likely related to the pre-fire habitat quality and the amount of post-fire canopy cover, large live or dead trees, woody debris, and understory vegetation. Low to moderate severity fire in high quality fisher habitat may still provide enough physical cover for fisher to forage or disperse, but not likely denning in the short-term. For high severity fires, retention of large trees and snags may be more important than canopy cover (Thompson et al. 2011). Observations of fisher in high severity fire affected areas may be related to the amount remaining physical structure especially for dispersal or possibly movements through the home range. However, high severity fire affected areas typically have no canopy cover or understory vegetation. Fisher are known to avoid crossing openings with no cover (Powell 1993, Jones and Garton 1994, Weir and Corbould 2010). Even areas with shrub and other ground cover, fisher are subject to higher rates of predation (Wengert 2013). In high fire severity affected habitat, the area may be used for dispersal, but denning and resting structures, although possibly present, may not have enough physical cover for fisher to adequately avoid predation.

Marten

Marten population viability is related to the amount and quality of habitat. Like fisher, marten are also associated with late-successional conifer forests characterized by an abundance of large dead and downed wood and large, decadent live and dead trees (Powell et al. 2003, Buskirk and Reggiero 1994). In general, marten elevation range overlaps the fisher slightly, but marten occupy higher elevations, typically in true fir and lodgepole forests. Marten appear to select particular physical structure in the forest over the tree species composition. Foraging sites are commonly associated with riparian areas near late-successional habitat (Zielinski 1983). Resting sites are common in large trees and snags and possibly logs and stumps that create an opening near the ground (Spencer 1987). Denning sites are typically cavities in large diameter trees or snags. Marten may inhabit younger forests as long as the area contains important habitat components for resting and denning (e.g. large trees and snags) (Thompson et al. 2012).

Martens typically avoid areas lacking sufficient overhead cover (Slauson et al. 2007) and are sensitive to forest fragmentation (Phillips 1994). Distribution of mature forest on the landscape scale may be the primary determinant of marten distribution and subsequently affect habitat selection at finer scales (e.g. home range) (Kirk and Zielinski 2009). Marten were found to select areas with more habitat, larger patch sizes, and larger areas of interior forest (Hargis et al. 1999, Kirk and Zielinski 2009). Habitat characteristics usually include high (>40%) canopy cover (Hargis et al. 1999).

Areas without overhead cover may inhibit marten movements. In the Rocky Mountains, marten were found to cross clearcuts (no standing trees) about 460ft in width (Heinemeyer 2002) while a different study found a similar relationship from a habitat modeling approach (Hargis et al. 1999). In other forest treatment areas that contain some structure (isolated trees, snags, and logs) in the unit, marten crossed areas up to 600ft in width (Heinemeyer 2002).

Marten dispersal is not well known or documented (Broquet et al. 2006). In Ontario, Canada, marten were found to disperse about 4 miles (maximum 112 miles) on average for females and about 11 miles (maximum 150 miles) for males (Johnson et al. 2009). Genetic testing has shown evidence of marten disperse over long distances (>150 miles) (Kyle and Strobeck 2003). The variation in the distances for marten dispersal may be in response to changes in landscape pattern and habitat loss (Hargis et al. 1999). Martens are sensitive to increasing size of open areas and decreasing distance between openings (Hargis et al. 1999). However, marten survival decreases as the distance of dispersal increases (Johnson et al. 2009). Therefore, marten that travel long distances have a much higher likelihood of dying compared to marten that disperse a short distance.

<u>Fire effects on marten habitat</u>

Fire, especially high severity fire, will affect marten habitat components similarly as described for fisher. Marten were found in burned habitat that had large amount of coarse woody debris (Paragi et al. 1996). Even though little research examines the effects of fire on marten habitat, fire effects on habitat are likely very similar to fisher except martens use higher elevation habitat.

Wolverine

Wolverine population viability is related to the amount and quality of habitat. Wolverines are typically associated with high elevation (>7,200 feet) montane conifer forest consisting of Douglas fir in lower elevation to true fir and lodgepole pine at higher elevation (Copeland et al. 2006). In California, wolverines have been documented at much lower elevations (1,600feet) than recorded for most of the species range. Studies in Montana, Yukon, and Alaska reported wolverines having a strong association to mid- to late-successional conifer forest habitat possibly indicating conifer forests as the preferred habitat type (Hornocker and Hash 1981, Banci and Harestad 1990), but wolverines have been found in a variety of high elevation habitat types (Copeland et al. 2006).

Young females typically establish residency next to or within the natal home range (Magoun 1985). Natal dens are difficult to find, but the small number of dens located were found in a variety of conditions from snow created caves, under tree stump or boulders or within dense conifer forest (Hash 1987). Males typically disperse possibly traveling great distances (e.g. 230 miles) and through varying habitat types (Magoun 1985). Wolverines are known to use rivers and streams as travel routes possibly because the riparian area provides water and food resources (Magoun 1985). Wolverines typically avoid humans and human related infrastructure, but a few exceptions have been recorded (Copeland et al. 2006).

"The dispersal and travel corridors that connect refugia, at least for males, likely need not have the habitat attributes necessary to support self-sustaining populations. Atypical or low quality habitats may be important to wolverines if they connect otherwise isolated populations and allow for genetic exchange or colonization." (Ruggiero et al. 1994)

Fire effects on wolverine habitat

Very little information is available for describing possible fire effects on wolverine habitat. The closest research related fire effects was a study that examined the effects of timber harvest on wolverine (Hornocker and Hash 1981) which is difficult to relate to fire effects because of the possible effects of human activity. However, wolverines commonly use conifer habitat that is susceptible to fire. Like marten and fisher, fire would alter wolverine habitat by removing canopy cover, large trees, snags, and large woody debris.

Assumptions for fisher, marten, and wolverine habitat use

- Fisher, marten, and wolverines appear to use similar habitat characteristics given the differences in elevation range and subsequent plant species differences.

Table 7. Habitat characteristics for fisher, marten, and wolverine habitat types.

Habitat type[1]	Habitat Characteristics
Denning/resting	• >50% Canopy Cover • Large live and dead trees • large woody debris
Foraging	• ≥40 - 50% Canopy Cover • May lack denning trees
Movement	• ≥20% overhead cover regardless of tree size

[1]Habitat types are a hierarchal with denning/resting habitat at the highest quality followed by foraging and movement. For example, movement can occur in denning/resting and foraging, but denning/resting is not expected to occur in movement habitat.

Analysis Indicator #1 - Habitat Connectivity

Fisher, marten, and wolverine occupy similar habitat of late-successional, dense conifer forest. These species are commonly found at different elevations with some overlap. Fisher are commonly observed at the lower 2/3 of the slope while marten occupy higher elevation within the true fir. Although no wolverines have been observed on the Forest for several years and there is very little information on wolverine in California, wolverines are suspected to use the true fir to alpine zones. However, all three of these species move across the landscape using higher or lower elevation conifer forest even though the elevation may be outside the average elevation range for the particular species.

For this analysis, we will be assessing the connectivity by measuring the change in gap distance between areas that provide the necessary cover to avoid predation. Using pre- and post-fire habitat GIS data, we will identify the large patches of habitat and areas that likely contain enough physical cover (e.g. large live or dead trees and coarse woody debris) for a fisher, marten or wolverine to move through. Habitat will be identified using Eveg GIS layer which provides canopy cover and tree size and called denning/resting, foraging, and movement habitat. RAVG data will be used to assess the fire effects on habitat and adjusted, but the fire affected habitat will be considered as still providing cover for these species.

The scale of this analysis is intended to reflect scale at which these species are likely to use the landscape relying on patches of habitat to provide for essential needs. This analysis uses these basic principles of habitat and its’ distribution to estimate the effects of this project on habitat connectivity. Research has argued a strong association between fisher and habitat characteristics (e.g. dense canopy cover, and large size of trees and snags). In addition, research has provided evidence that large gaps between habitat patches may influence movement of these species. Therefore, changes in habitat that create large distances between habitat patches will likely affect these species’ movement or possibly increase the risk of predation, especially for fisher and marten.

Assumptions for fisher, marten, and wolverine connectivity analysis

- Fisher, marten, and wolverine habitat is used as described above.
- Fisher, marten, and wolverine are not likely to cross habitat openings without snags and coarse woody debris >600ft in width.
- Fisher, marten, and wolverine will not cross barren openings without physical structure (e.g. trees, snags, or coarse woody debris) >160ft in width.
- All pre-fire habitat that received high fire severity (>75% of basal loss) is considered non-habitat for this analysis
- All pre-fire habitats that received moderate fire severity (50-75% basal loss) will reduce in habitat quality.
    - Pre-fire denning/resting and foraging habitat will become movement habitat
    - Pre-fire movement habitat will become non-habitat
- Salvage and site-prep/plant will reduce all pre-fire habitat to non-habitat
- Fuels treatment (except underburn) will downgrade habitat
    - Post-fire denning/resting will become foraging habitat
    - Post-fire foraging will become movement habitat

- Post-fire movement will become non-habitat

Spatial and Temporal Bounds

The spatial bound is the 7th field watersheds that overlap the project area. Depending on the sex, the fisher's average home range is 4.7 to 36 square miles, the marten's home range is 1 to 6 square miles, and the wolverine's home range is 38 to 347 square miles with the closest located study to the project area reporting an average of 130 square miles (USDI FWS 2014, Ruggiero et al. 1994). The 7th field watersheds in the analysis area range in size from 2.8 to 18.1 square miles. The 7th field size overlaps the range of fisher and marten home range, but it doesn't match well with wolverine. Like mentioned before, wolverine occupy high elevation habitat, but need to move through lower elevations to reach other patches of high elevation habitat and most of the project area is below the elevation needed to make up the home range. Therefore, the smaller scale analysis will capture the effects to wolverine movements mostly outside the home range for the wolverine.

The short-term temporal bound is the time during implementation (about 5 years). The long-term is >20 years to represent the time when the snags will begin to fall over.

Criteria for assessing fisher, marten, and wolverine connectivity

Since the fisher, marten, and wolverine have an overlap in general habitat use, one habitat layer will be used for this analysis. In addition, the fisher and marten appear to be similarly vulnerable to predation thus the analysis incorporates distances of opening crossed by fisher and marten as reported (Heinemeyer 2002). The desired condition is to have a high level of connectivity. The amount of denning, resting, foraging and movement habitat will be assessed for connectivity, but these acres of habitat will be interpreted into four categories based on the criteria below (table 4). Connectivity will be a relative measure based on current conditions.

Table 8. Criteria for fisher, marten, and wolverine connectivity analysis

Connectivity	Criteria
High	• Average distance between habitat patches is <160ft within 7th field watershed
Moderate	• Average distance between habitat patches is 160 - 460ft within 7th field watershed
Low	• Average distance between habitat patches is 460 - 600ft within 7th field watershed
Very Low	• Average distance between habitat patches is >600ft within 7th field watershed

High connectivity means that there is sufficient habitat to provide cover for fisher, marten, and wolverine moving within the 7th field watershed. Moderate connectivity provides some challenge moving in the 7th field thus increasing risk to mortality and extra expense of energy to deviate around large openings. Low connectivity presents great challenge because these species will likely need to shift the territory to a more contiguous placement of habitat. The final category, very low, represents a situation where the openings exceed the distance not likely to let these species to move through the 7th field watershed.

Analysis indicator #2 – Change in Fisher Home Range

Fisher Home range selection is important because the home range must provide sufficient resources for survival and reproduction. Some of the basic characteristics of home range selection appear to be related to tree canopy closure, tree size class, percentage of conifer, and openness (area with little to no overhead cover) (Carroll et al. 1999, Wier and Corbould 2010). However, the amount and distribution of these habitat characteristics can affect a fisher home range. Fisher habitat can be split into three habitat categories: denning/resting, foraging, and movement (described in table 8). Denning/resting habitat is typically the least common on the landscape followed by foraging. Movement habitat which provides overhead cover for fisher to move from one patch of denning/resting habitat to another and avoid predation is more common.

The loss overhead cover creates openings that may affect the function of a fisher home range. Fishers avoid crossing large openings (discussed earlier in the fisher, marten, and wolverine analysis indicator section) and moving around these large openings while staying within habitat may not be feasible for a home range to function. For example, Weir and Corbould (2010) found that fisher occupancy decreases with the increase in openness within the home range. This basically means that fisher home ranges that experience an increase in openness (loss of overhead cover) to about 20% of the home range will likely not be occupied by fisher. In addition, fisher home ranges need about 50% or more denning/resting and foraging habitat in the home range with at least 50% tree canopy cover. Therefore a fisher home range needs about half of the home range with at least 50% canopy cover and 30% of the home range with 20% overhead cover.

Identifying the actual home range of fisher is difficult because it requires extensive monitoring of individuals that are tagged with some kind of transmitting device. We don't have this level of information for any of the fisher home ranges in the project area, but using some the basic principles identified in fisher research, we can estimate the potential effects.

Female fisher home range size can vary among and between populations. For studies near the project area, female home ranges averaged between about 420 acres (Hoopa Valley Indian Reservation) to 5,810 acres (Shasta-Trinity National Forest). The project area contains similar habitat to the Shasta-Trinity National Forest, but the differences in habitat on the Klamath NF may result in a slightly smaller average fisher home range. For the purpose of this analysis, we are using about a 5,000 acre home range within a 7^{th} field watershed to define a representative home range.

Assumptions for fisher home range analysis

- The average home range size of a female fisher is about 5,000 acres and the watershed represents a representative home range
- Home ranges must contain habitat characteristics as described in the table below
- All pre-fire habitat that received high fire severity (>75% of basal loss) is considered non-habitat for this analysis
- All pre-fire habitats that received moderate fire severity (50-75% basal loss) will reduce in habitat quality.
    - Pre-fire denning/resting and foraging habitat will become movement habitat
    - Pre-fire movement habitat will become non-habitat

- Salvage and site-prep/plant will reduce all pre-fire habitat to non-habitat
- Fuels treatment (except underburn) will downgrade habitat
    - Post-fire denning/resting will become foraging habitat
    - Post-fire foraging will become movement habitat
    - Post-fire movement will become non-habitat

Spatial and temporal bounds

The spatial bound is the 7th field watersheds that intersect the project area. The 7th field watershed is used because the size of the watershed fits within the range of a female fisher home range size and it is a natural division in the landscape.

Criteria for assessing change to fisher home range

The desired condition is to maintain all the potential female fisher home ranges in the project area. Several potential fisher home ranges have been affected by the fire resulting in a reduction in amount and distribution of fisher habitat. Therefore, treatment that would reduce the amount of cover below the defined minimum habitat amounts may result in a loss in a fisher home range.

Table 9. Criteria for quality of future habitat for fisher, marten, and wolverine

Female fisher home range	Proportion of habitat within 7th field watershed
Maintain home range	Each watershed contains • At least 50% of the watershed contains denning/resting and foraging habitat, AND • Up to 50% of the watershed contains movement habitat, AND • No more than 20% of the watershed contains non-habitat (<20% canopy cover).
Loss of home range	• <50% of the watershed contain denning/resting or foraging habitat, OR • >20% of the watershed contain <20% canopy cover

A loss of a home range is difficult to estimate in terms of population viability. Habitat loss is difficult to replace and may take many years before the habitat may develop into habitat again. However, this analysis doesn't use true home ranges rather the analysis provides a metric to display the potential effects. The loss of one home range may not have large effects, but the loss of several home ranges could result in large effects to the population. Maintaining a home range will result in the artificial home range to persist despite the effects of the project.

Pallid Bat, Townsend's Big-eared Bat, and Fringed Myotis

Pallid bats occur throughout a large portion of California. They are usually found in brushy, rocky terrain, but have been observed at edges of coniferous and deciduous forest. Day and night roost structures include buildings, bridges, large decadent snags, and rock outcrops. They can roost alone or in a group, but they switch roost sites sometimes on a daily basis.

Fringed myotis bats appear adapted to live in areas with diverse vegetative substrates. They are associated with a variety of habitats including conifer forests and oak woodlands. They roost in buildings, bridges, caves and mines, and in crevices and cavities in large trees and snags. (Ellison et al. 2004). Maternity colonies are found in caves, mines, and buildings (Ellison et al. 2004). Day roosts can be found in tree cavities or under loose bark on a tree (Rasheed et al. 1995).

Townsend's big-eared bats occupy inland deserts, oak woodland of the inner coast range, and mid-elevation mixed conifer-decidous forest. Distribution of this species is patchy and strongly associated with the availability of caves and cave like roosting structures (Pierson and Rainey 1998).Townsend's big-eared bats typically roost and hibernate in mines and caves, but have been found roosting in hollow trees, as well (Fellers and Pierson 2002).

Threats to bats

The three primary threats to bats are disturbance, habitat alteration, and toxic chemicals. All three of these bat species are susceptible to disturbance from noise and human presence. Bats are especially sensitive to disturbance at hibernation sites and maternity roost sites which typically occur in caves in cave like structures (e.g. mines and buildings). The disturbance of maternity or hibernacula can lead to the mortality of individuals or possibly population viability (Richter et al. 1993). Habitat alteration can reduce the distribution and quantity of day and night roost structures (e.g. snags) and it can affect the microclimate of maternity and hibernacula depending on the proximity to the cave entrance (Keinath 2003). Changes to microclimates in maternity roosts can result in the cave or mine not providing the needed conditions for offspring thus resulting in the loss of a maternity cave that is very limited on the landscape. Therefore, the loss of a maternity roost would likely affect population viability. This project doesn't propose to use chemicals that would harm bats.

Analysis Indicator #1 – Risk of Disturbance

The Forest Plan recommends no timber harvest within 250 feet of roost site (S&G pg. 4-32) (i.e. hibernacula or maternity). This Standard and Guideline was developed to avoid noise disturbance and potential modification to the microclimate near the roost site entrance. This would conserve the entrance of a roost where bats would be entering and exiting and the microclimate of the roost. Conservation documents for fringed myotis and Townsend's big eared bat both recommend doubling the 250ft recommendation to further reduce the potential of noise disturbance for bats that may be foraging in the area of the roost (Pierson et al. 1999 and Keinath 2003). To take this recommendation a step further, Keinath (2003) suggested to avoid forest management within 0.25mile of a potential maternity or hibernacula to reduce the potential disturbance of foraging bats plus potential day roosts close to the maternity or hibernacula.

Data used for analysis

The project area doesn't contain any known bat hibernaculum or maternities, but caves and mines do exist in the project area. In order to account for the potential existence of a undiscovered hibernacula and maternity site, we used geological mapping as a proxy to located bedrock that typically contains caves (marble/limestone deposits) within the project area. For mining activity, we also used the Forest mining GIS data to identify the type of mine and locations. Using the combination of the geological data and mining data, we created a buffer from all potential areas that may contain cave and cave like structures (possibly containing a maternity or hibernacula) and overlapped this buffered area with project activities for each alternative to estimate affects to these bat species.

Assumptions for pallid bat, fringed myotis, and Townsend's big-eared bat disturbance analysis

- All the areas that may produce caves and cave like structures that may contain hibernacula and maternity sites have been identified for the analysis
- Fringed myotis, pallid bat and Townsend's big-eared bat are equally negatively affected by disturbance

Spatial and temporal bounds

The spatial bound for these bat species is 0.25 mile around all potential hibernacula and maternities within the project area. The temporal bounds is about 5 years for the short-term and >10 years for the long-term.

Criteria for assessing disturbance to bat hibernaculum or maternity

This analysis will assess the activities proposed to occur within the given buffer distances that will create noise or modify forest habitat (table 6). The acres of activity occurring within each buffer will be presented.

Table 10. Risk of disturbance to bat hibernaculum or maternity

Risk of Disturbance	Buffer and disturbance
High	Prolonged activities within <250ft of potential hibernacula or maternity site
Moderate	Prolonged activities within 250-1,320ft of potential hibernacula or maternity site
Low	Prolonged activities within >1,320ft of potential hibernacula or maternity site

High risk of disturbance may result in a maternity being abandoned with the fate of the offspring likely dependent on their age. High disturbance of hibernaculum will likely result in all bat ages leaving the warmth of the cave to the colder outside that may result in bat death. Moderate risk of disturbance is not likely to affect the maternity or hibernaculum, but rather disturbance to individuals coming and going from the cave (excluding the winter months). Low risk of disturbance would be potentially disturbing very few individuals from a foraging area, but no disturbance of the hibernaculum or maternity.

Willow Flycatcher

The Forest is within the range of the willow flycatcher for nesting, but the species migrates to Central and northern South America for the winter thus this analysis focuses on reproduction. On the Forest, willow flycatchers have been captured in mist nets along the Klamath River, but no nesting has been recorded on the Forest despite available habitat along the Klamath River and lower reaches on some of its' tributaries. This suggests the Klamath River is an important migratory corridor for willow flycatchers, but reproduction may not be common on the Forest.

Willow flycatcher, like many other small birds, have a small reproductive territory (0.8 acres to 6 acres), but the territory size varies geographically and habitat quality (Eckhardt 1979). Habitat quality can be based on structural characteristics, spatial distribution, and vegetation species composition (Weins et al. 1987). Consequently, willow flycatchers are known to occupy a variety of open, brushy habitats (Kahl et al. 1985), but they often require the presence of small tree or shrub thickets (Graber et al. 1974) near surface water (Walkinshaw 1966).

In California, breeding habitat is typically moist meadows with perennial streams dominated by willows, primarily in tree form and cottonwoods or smaller wet areas with willow or alders (Serena 1982, Harris et al. 1988, Whitfield et al. 1997). Riparian deciduous shrubs or trees, such as willow or alder, are essential elements on willow flycatcher territories (Sanders and Flett 1989, Harris et al. 1988). This habitat type is most likely to occur in 3rd order streams or greater on the Forest. Streams of lower order are typically steep in elevation and don't provide areas commonly providing the desired vegetation. In addition, wet meadows can provide similar habitat components and wet meadows are commonly used in the Sierras.

Willow flycatcher habitat often occurs within a riparian corridor. Naiman et al. (1993) described a riparian corridor as the area that encompasses the stream channel and the portion of the terrestrial landscape from the high water mark towards the uplands where vegetation may be influenced by elevated water tables or flooding, and by the ability of soils to hold water. This description is very similar to the Forest's Management Area - Riparian Reserves. Riparian Reserves generally include the aquatic ecosystem and adjacent upland areas that directly affect it. The widths of riparian reserves vary to incorporate the differences in water influenced area and subsequent riparian vegetation. The riparian reserve description is available in the PDFs of chapter 2 of the EIS of the Forest Plan (Page 4-106).

Analysis Indicator #1 – Habitat alteration

Research that links the effect of habitat alteration on population viability is rare, but it can be assumed that the loss of nesting habitat translates into less area for possible reproduction. Research has presented the average size of a territory, important habitat components, and susceptibility to disturbance (Eckhardt 1979, Serena 1982, Taylor 1986, Harris et al. 1988, Sanders and Flett 1989, Whitfield et al. 1997). It is difficult to translate the number of territories actually affected by the proposed activities, but it can assume based on the average size of territories that even one acre of riparian habitat could affect willow flycatchers. Therefore, small changes in habitat associated with reproduction could have large effects on the willow flycatcher, if present.

Assumptions for willow flycatcher habitat alteration analysis

- High severity fire affected riparian habitat is considered non-habitat
- Vegetation management outside riparian reserves will not affect habitat quality
- The proportion of habitat removed is proportional to the level of population effects
- Flycatchers are associated with 3rd order streams and greater. The resident fish occurrence on the Forest is generally the same distribution thus the resident fish

distribution was used as a proxy to identify the waterways possibly containing desired flycatcher habitat

- Salvage will not occur in riparian reserves
- Plantations are unlikely to contain flycatcher habitat so only treatment in non-plantations were assumed to potentially contain habitat.
- Hazard tree removal will occur in riparian reserves, but will not remove flycatcher habitat
- For cumulative effects
    - USFS projects will retain willow/alder vegetation in riparian reserves because of project design features
    - All non-Forest Service projects are not subject to the same restrictions as the Forest thus it is assumed that these projects will remove willow/alder in the projected riparian reserve buffers

Spatial and temporal bounds

The spatial bound is defined within the riparian reserves in 3rd order streams or greater using resident fish distribution as a proxy within the project area plus wet meadows. The temporal bound in the short-term is about 5 years and long-term is 10 years.

Criteria for assessing willow flycatcher habitat alteration

The desired condition is to retain all existing live willow and cottonwood thickets and minimize disturbance to surrounding riparian vegetation. This analysis will estimate the amount of habitat disturbed in riparian reserves by the proposed activities and the level of effect will be presented in acres and in proportion of habitat affected based on the 7th field scale.

Table 11. Level of habitat alteration for willow flycatcher habitat

Level of Habitat Alteration	Estimated proportion of habitat affected in 7th field watershed
High	>10% of the habitat disturbed
Moderate	5-10% of the habitat disturbed
Low	<5% of the habitat disturbed

High level of habitat alteration will likely greatly affect flycatcher reproduction by watershed given the patchy distribution of habitat. Moderate level will likely affect a small number of territories, but may have localized effects on the population. Low of habitat alteration may still affect individuals, but the population will likely not be affected.

Siskiyou Mountains Salamander

Siskiyou Mountains salamander is limited to areas that provide microclimates with high relative humidity and relatively low temperatures during the summer months. Their skin must be moist and permeable for gas exchange, but outside their burrows, their skin can dry which can result in death; this species must be close to structure to retreat when conditions are too dry. To restrict water loss, this species may limit surface activity to only very wet periods. While at the surface, they remain under surface cover objects during the day and are active at night. This species of salamander is primarily "sit and wait" predator which forages primarily on small invertebrate prey on the forest floor or beneath cover objects at night. It is also likely that they opportunistically feed under cover objects during the day (Welsh and Droege 2001, Ollivier et al. 2001).

On the Forest, Siskiyou Mountians salamanders are found in areas with more boulders, deeper leaf litter, higher canopy closure, higher subsurface temperatures, and lower fern cover (Ollivier et al. 2001). Canopy closure which helps to maintain moist, relatively cool forest stands capable of supporting stable microclimates appears to be an essential indicator of salamander presence (average canopy closure of about 80.6%, Ollivier et al. 2001). Generally, these salmanaders are found in forested stands of larger conifers producing high canopy closure (>70%), moist microclimate and rocky soils (typically rock larger than 2in diameter) (Ollivier et al. 2001, Welsh et al. 2007).

Surprisingly, Siskiyou Mountains salamanders are not reported to use downed woody debris for cover or as refugia during periods of inhospitable climatic conditions; however, woody debris may occasionally be used as cover when it occurs in conjunction with rocky areas. Ollivier et al. 2001) suggested woody debris may also produce a portion of Siskiyou Mountains salamanders' prey base since several invertebrates are associated with decaying woody debris, but this would only apply to woody debris occurring on salamander habitat.

<u>Fire effects on habitat</u>

One of the primary threats to Siskiyou Mountains salamander is loss of high quality habitat. Salamanders move vertically through the substrate in response to climatic charges. When the soil surface conditions are correct, the salamanders come to the surface for courtship, breeding, and feeding (Feder 1983, Verrell 1989, Welsh and Droege 2001). However, if the vegetation conditions change (e.g. fire or timber harvest) the micro-climate conditions near the soil will be affected thus affecting the salamander habitat quality. The length of time a population may remain viable if surface climatic conditions change from disturbance is not known, but it is likely these individuals have to remain subsurface to avoid stress or move to higher quality habitat (Ollivier et al. 2001).

Siskiyou Mountains salamanders are thought to move only short distances like many other species of salamanders. A closely related salamander species was found to move <1.5m (Olson 2007), but another study found this same salamander species moved much further (40m) (Cabe et al. 2007). These studies suggest that under certain conditions salamanders are capable of moving several meters, but the distance is likely limited by microclimatic conditions and predation.

<u>Forest Management effects on habitat</u>

Siskiyou Mountains salamander habitat is mostly comprised of lose rock and soil where salamanders can move through the small pockets of space up to several feet below the forest floor. Disturbance of this habitat by heavy equipment can compact the rock and reduce the ability of salamanders to move through their habitat. Compaction can also harm individuals that are near the surface (Olson et al. 2007).

The removal of canopy cover around salamander habitat can affect the microclimate and possibly populations. DeMaynadier and Hunter (1995) reviewed 18 studies of salamander abundance after clearcut timber harvest and found median abundance of amphibians was 3.5

times greater on controls over clearcuts. Petranka et al. (1993) found that salamander abundance and richness in mature forest were five times higher than those in recent clearcuts and they estimated that it would take as much as 50-70 years for clearcut populations to return to pre-clearcut levels. A comparison of recent (<5 years) regeneration harvest units and mature (120 years) forests also suggested salamanders are eliminated or reduced to very low numbers when mature forests are clearcut (Petranka et al. 1994).

Management Suggestions (Olson et al. 2007)

The authors created three primary management suggestions to reduce risk of affecting local salamander populations (site scale).

1) Maintain >70% canopy closure on ≥80% of the habitat and ≥40% canopy closure on the remaining 20% of the habitat.
2) Avoid ground disturbing activities on 80% of the known sites. Known sites are locations where the species has been located.
3) Limit activities in habitat to late spring through early fall before 1.5 inches of rain fall. During the dry period of the year, the salamanders are thought to be far enough below the surface to avoid harm.

Analysis Indicator #1 – Habitat alteration

Siskiyou Mountains salamander range overlaps one subunit (Happy Camp) of the project area. This area has been surveyed for the species and several known sites exist. However, many of these known sites have been affected by fire. Treatment is proposed in areas that burned at high severity and have lost most or all the canopy cover. Even though canopy cover is likely a critical component for Siskiyou Mountains salamander habitat, we are not analyzing canopy cover because we expect very little canopy cover to be affected by the project. Instead, this analysis will focus on assessing the level of risk to local populations based on the amount of habitat disturbed by treatment.

Assumptions for Siskiyou Mountains salamander habitat alteration analysis

- Despite the loss of canopy cover:
  - Salamanders will persist in known sites
  - Persistence is based on disturbance
- Surveys have identified all occupied habitat

Spatial and temporal bounds

The spatial bound will be the project area. The temporal bound in the short-term is the time during implementation about 5 years. The long-term is >10 years.

Criteria for assessing Siskiyou Mountains salamander habitat alteration

The desired condition for this analysis is a Low Risk of habitat disturbance. This analysis will use prior survey data to identify known site locations and estimate the level of ground disturbance to known sites based on the treatments for each alternative. The amount of disturbance will equate to a risk level (table 8). Since this species doesn't move far, we will buffer each known location by 130 feet to represent a maximum distance a salamander might move even though the entire area may not contain suitable habitat.

Table 12. Level of Risk to Siskiyou Mountains salamander habitat

Level of Risk	Proportion of known sites
High	>25% of known sites disturbed by proposed activities
Moderate	20-25% of known sites disturbed by proposed activities
Low	<20% of known sites disturbed by proposed activities

A high proportion (>25%) of known sites affected by equipment or associated activities will likely result in greatly affecting the population. The moderate level may present effects to localized areas and will still affect the population but a lower magnitude. Finally, low risk will still affect individuals but it will likely not affect the population.

Tehama Chaparral Snail

Snails, in general, have limited mobility and are reliant on specific habitat requirements. Snails require moisture for breathing and movement thus moist to wet, humid microclimates are critical for most snail species' survival and reproduction. During dry periods of the year, snails must conserve body water by avoiding intense sun exposure, elevated temperatures, and reduced humidity (Kappes 2005). Snails are so sensitive to the loss of moisture that the primary cause of snail death (all life stages) is considered to be desiccation (Asami 1993).

The level of moisture needed for snail to reproduce and survive is dependent on the species (Asami 1993). Snail species found in arid habitat tend to have greater tolerance and range of moisture conditions compared to a snail species found in moist habitat (Asami 1993). Moisture conditions are related to several factors, but dense tree canopy cover, abundant physical structures, and close proximity to water can produce desired microclimatic conditions (Asami 1993).

Snail habitat can vary between species, but the habitat must meet their needs. Plant (dead or alive) is the base food source for most snail species even though preferred plant species may vary greatly between snail species (Gervais et al. 1998, Sarma et al. 2007). Although one study reported a higher snail density in conifer forest (Locasciulli and Boag 1987), most studies found snails dependent on deciduous tree litter (Karlin 1961, Addison and Barber 1997, Abele 2010). Reasons for the reduced number of species found in conifer forests is thought to be related to reduced food sources, lack of essential mineral (i.e. calcium), and resinous extracts from conifer tree species (Karlin 1961). There are species specific responses to particular habitat types, but generally, most land snails are found in deciduous forests while others may be found in deciduous and conifer mixed forests (Abele 2010). Overall, deciduous tree leaf litter appears to be a component of land snail habitat.

Coarse woody debris is an important habitat component for many mollusk species. Woody debris can absorb and retain water for several weeks during periods without precipitation thus creating moist environment for snails (Kappes 2005). Moist, decaying logs provide an area for hibernation, feeding, breeding, egg development, and simply shelter thus a shelter from microclimatic extremes (Kappes 2005). Coarse woody debris may also buffer the effects of disturbance. The removal of canopy cover can change the microclimate, but woody debris may provide cool, moist conditions for possibly a short period of time (Bros et al. 2011). However, coarse woody debris can't correct the overall result of losing canopy cover to microclimate conditions.

The Tehama chaparral snail is not well studied thus little information is available that describes the habitat. Generally, the species' habitat is composed of rocky areas (talus), deciduous hardwood and shrub leaf litter, and other debris (e.g. logs) covered with abundant shade (Burke et al. 1999). Dunk et al. (2002) found a weak but statistically significate relationship between species occurrence and riparian reserves suggesting this species may be prefer habitat near streams; riparian areas typically provide high relative humidity that is desired by most, if not all land snails. In the drier portions of this species range, the talus areas provide refugia from predators, temperatures, and moisture extremes; the snails rarely travel more than 33ft beyond talus habitat (Duncan et al. 2003). The size and type of the rock in the talus may be an important habitat characteristic; this species is more commonly associated with talus composed of small (<3in dia) limestone and basalt rock (Duncan et al. 2003).

Fire effects on habitat

Fire is a natural process that plays a significant role in the forest ecosystem in the northwest (Agee 1993), but fire effects on snails are highly variable (Kiss and Magnin 2006). Fire has the potential to negatively influence snails in several ways: directly by fire-related mortality and indirectly by altering microclimate, reducing food resources, and eliminating shelter. Even though habitat loss can influence snail populations, the direct loss of individuals can be more detrimental (Kiss and Magnin 2006).

In some situations, snails can survive a fire by retreating into shelter or by circumstance of individuals being below the ground surface (Kiss and Magnin 2006). However, the fire severity does influence the persistence of surviving snails (Beetle 1997). High and moderate severity fires likely consume all the leaf litter and possibly coarse woody debris which wouldn't provide the necessary microclimate for snail survival. Any surviving snails will likely need to move to lower severity burn or unburned forested habitat to survive (Kiss and Magnin 2006). Coarse woody debris can aid in snail dispersal in fire affected habitat by providing cover and refugia (Burke 1999). Small, minimally affected patches of habitat within the burned area can provide enough habitat area for individuals to survive and possibly reproduce (Kiss and Magnin 2006). In the short-term (<5 years), live snails are generally not found in high fire affected areas (Beetle 1997, Anderson 2004). The loss of occupied areas may persist for many years possibly until trees regenerate and produce a canopy cover (Burke 1999).

Threats to snails

Generally, land snails are threatened by the loss or degradation of habitat (e.g. land management and fire). Canopy cover creates the basis for creating cool, moist microclimate and without it, the snail habitat is likely not viable over the long-term. The loss of coarse woody debris could affect the occupancy of habitat; coarse woody debris provides a refugia for snails during drier periods of times. Soil and talus compaction (e.g. heavy equipment) can eliminate possible refugia for snails. Finally, fragmentation (e.g. removal of habitat or road construction) can disconnect groups or possibly populations of snails, but based on microclimate conditions, patches of habitat >2.5 acre can provide similar conditions to larger patches of habitat thus even small patches of live trees are valuable to this species (Aubry et al. 2009).

Analysis Indicator #1 – Habitat alteration

Tehama chaparral snails appear to be most susceptible to a loss of canopy cover, reduction of woody debris, and talus compaction. Most of the proposed activities in this project will occur in high severity fire affected forest which has little to no live canopy remaining. These high severity affected areas will likely not support a snail population and these snails will likely disperse to less affected habitat. Given the circumstances of the fire affected habitat and criteria set for harvest dead and dying trees, woody debris is an appropriate and necessary structure for aiding dispersing snails.

Assumptions for Tehama chaparral snail habitat alteration analysis

- Species occurs in hardwood/conifer mixed forest in Happy Camp and Beaver project subunits.
- Woody debris (≥12in diameter) will help snails within fire affected habitat disperse to favorable habitat.
- Both snags (standing dead trees) and down wood will be counted in the criteria based on modeled results.
- Pre-fire habitat that burned at high severity (75-100% basal area loss) is considered non-habitat

Spatial and Temporal scale

The spatial scale is the Happy Camp and Beaver subunits. The temporal scale is about 5 years the time for implementation. Long-term is >20 years.

<u>Criteria for assessing Tehama chaparral snail habitat alteration</u>

The desired condition for Tehama chaparral snail is to provide a high level of woody debris. This analysis will use pre-fire GIS habitat layer and known sites where snails have been located to identify treatment units that may contain snails. The amount of woody debris will equate to the likelihood of snails being able to disperse (table 9). The research presented in this document didn't state a specific level of woody debris that would provide high likelihood of dispersal. However, given the length of 12in diameter trees (assumed 60ft) and the width of a square acre (208ft), seven logs laid end to end would cross a square acre twice (420ft).

Table 13. Likelihood of dispersal for Tehama chaparral snail

Likelihood of Dispersal	≥12in diameter logs/acre
High	>7 logs/ac
Moderate	5-7 logs/ac
Low	<5 logs/ac

High likelihood of dispersal means that there will be a sufficient amount of woody debris to provide cover and moist conditions for snails to move from one location to another. Moderate likelihood of dispersal will provide enough woody debris for snails to move through part of the area, but will likely present open areas that will impede their movement or lower survival. Low likelihood of dispersal will provide little continuous cover thus will lower survival of individuals possibly to the point of severing connectivity between populations of snails.

Western Bumble Bee

Bumble bees have an interesting life cycle that is important for understanding the potential effects to the species. The queen survives the winter and emerges in the spring from hibernation and immediately starts foraging. The queen will look for a nest which is often below the ground in an abandoned rodent hole or the nest could be above ground in tufts of grass, old birds' nest, or cavities in trees. The queen lays her eggs and provides pollen to the larvae until the workers become large enough to gather the pollen and nectar for themselves, typically resulting in a small colony (50-500 individuals). The queen will stay at the nest and continue laying eggs and by the end of fall, the queen will find an overwintering site, but the workers will not survive the winter (Hatfield et al. 2012).

Bumble bees need three primary components to thrive: 1) flowers for foraging, 2) nest site, and 3) a place to overwinter. Bumble bees are generalist foragers which seek pollen and nectar as a food source. This activity starts late winter to early spring and ends early fall. Bumble bees require a large amount of area for foraging. Estimates of 800 to 2,500 acres of flowering plants have been suggested for a healthy bumble bee colony, but the actual distance a bumble bee may travel has been estimated to be about 230 - 2,070ft (Osborne et al. 1999, Hatfield et al. 2012). Nests and overwinter sites usually occur near the ground so any ground disturbance can be detrimental to the colony including the queen.

In general, bumble bees prefer open meadow like areas with a high diversity of plant structure with an abundant amount of flowering plants (Hatfield et al. 2012). Habitat can also extend into agricultural fields or orchards where flowering agricultural plants can provide similar food resources (Hatfield et al. 2012).

<u>Fire effects to habitat</u>

There is little research on the effects of wildfire on bumble bees, but using prescribed fire as a proxy, there are some general relationships that can be built. Wildfires usually occur during the summer and fall when bumble bees are nesting and foraging for pollen and nectar. The nest sites are usually near the surface of the ground and consequently susceptible to fire. During the period of most wildfires, workers are flying from the nest to flowers and back again which makes them vulnerable to fire. Therefore, a fire could kill the entire colony. If a colony did survive a fire, the foraging habitat would certainly be affected by removing flowering plants possibly beyond the estimated maximum distance a bee may forage. It would be very difficult for a colony to persist in a fire affected area until the flowering plants reestablished possibly the following year.

<u>Threats to bumble bees (partial list from Hatfield et al. 2012)</u>

- Reduction in floral resources
- Ground disturbance (e.g. mowing and plowing)
- Fire during the spring through fall (March to September)
- Pesticide use
- Disease
- Competition with non-native bees

Analysis Indicator #1 - Habitat disturbance

The desired condition for bumble bee is a low level of disturbance. The western bumble bee like other species of bumble bees is sensitive to habitat disturbance. In the project area, high quality bee habitat is likely to occur in the meadows where several species of flowering plants occur. The meadows also offer higher density of plants to provide additional structure and small animal burrows. Heavy equipment and tree harvest are the most likely source of ground disturbance in this project.

Assumptions for bumble bee habitat disturbance analysis

- Bumble bee nest sites and overwinter sites only occur in meadows with a density of one colony per 2,070 feet radius
- Disturbance outside the meadows will not influence the success of a bee colony or overwinter site
- The acres of meadow disturbance (table below) represent the level of potential disturbance to a bee colony resulting from ground isturbance

The spatial bound is the meadows contained within the area composed of treatment units plus 2,070 feet buffer. The temporal bound in the short-term is about 5 years (during the period when implementation is expected to occur) and long-term is 10 years.

Criteria for assessing western bumble bee habitat disturbance

The desired condition for this indicator is a low level of disturbance. Disturbance can occur from many different sources such as human footsteps over a nest or heavy equipment in the near area. Many of the sources of disturbance will not result in the loss of a nest site, rather disturbance will likely result in the bees unnecessarily expending energy to respond to the disturbance. However, disturbance can result in the loss of a nest, especially if the nest is above the ground within treatment units. The project area has not been thoroughly surveyed for bumble bees and it isn’t practical to do so. Therefore, the analysis will use the amount of area affected by treatment in areas most likely to contain a colony to assess the level of effects to bumble bees.

Table 14. Level of disturbance for western bumble bee

Level of Disturbance	Acres of meadow habitat disturbed per 7^{th} field watershed
High	≥5 acres
Moderate	1-4 acres
Low	<1 acre

Treatment that occurs in 5 or more acres of meadow habitat within a given watershed has a high level of disturbance that would result in affecting at least one bee colony where reproduction would be compromised. Moderate level of disturbance would result in removing flowering plants through operations disturbance of the vegetation or preventing bees using an area because of human activities. This would result in bees traveling further to find food resources, if a colony is present within close proximity of the treatment. A low level of disturbance would be an interruption of bee activities lasting a few hours.

Affected Environment

Prior to the fires in 2014, the project area provided complex habitat for many species. The Beaver project area contained checkerboard ownership and has been strongly influenced by land management over the past several decades. Even though the Beaver project area is capable of growing late-successional habitat, the project area was largely composed of oak woodlands and brush with two larger pockets of mid-seral mixed conifer. These patches of mixed conifer provided habitat for fisher and potentially Pallid bat, Townsend's big-eared bat, and fringed myotis while the oak woodland and mixed conifer provided habitat for the Tehama chaparral snail. The Happy Camp and Whites Project Area contained similar distribution of habitat. These two project areas are mostly mid to late-successional habitat with pockets of early seral and brush and provided some of the most contiguous conifer habitat on the Forest. Overall, these three project areas contained over 60% mid to mature mixed conifer forest habitat[1] and the remaining 40% was made up of oak woodland habitat (5%), early serial forest habitat (20%), and brush habitat (15%) prior to the 2014 fires.

The 2014 fires burned a large portion of the project area at moderate and high severity and reduced two important habitat types on the Forest – oak woodland and mid to late successional mixed conifer habitat. The fire resulted in large portions of mid and late seral habitat being lost or greatly reduced in habitat quality. About 25% of the pre-fire mid and late-seral habitat was lost (trees were likely killed by the fire) and about 40% of the pre-fire oak woodland was also lost to the fire. These fire affected areas are now set back to an early seral state which was abundant throughout the Forest prior to the 2014 fires. Overall, most of the moderate and high severity affected areas will not support the same wildlife species for many years while the low severity burned habitat is likely to continue to function similar to the pre-fire condition and support many of the same wildlife species as it did pre-fire.

Northern Spotted Owl

The analysis area includes 80 NSO activity centers (AC) that occur in the analysis area and have been active at some point since the early 1980s. Many of these ACs have not been active for many years typically related to a change in habitat conditions (e.g. fire), but in most cases, the reason for no activity is unknown. In addition, there are a few ACs with questionable origin and appear to have been established based on a single observation with no evidence of reproduction. Although a single observation doesn't necessarily warrant an AC designation, we are analyzing all possible ACs based on survey data from the Forest and California Department of Fish and Wildlife databases. The analysis area is about 262,450 acres in size; the analysis area contains about 27,440 acres of nesting/roosting, 52,240 acres of foraging, and 51,760 acres of dispersal habitat. In addition to NSO habitat (nesting, roosting, foraging, and dispersal) as described by several documents (e.g. 2012 NSO Recovery Plan), we are reporting the acres of post-fire foraging area (5,240 acres). A detailed description of affected environment for the northern spotted owl is described in the project Biological Assessment.

Analysis Indicator 1 – Risk to Reproduction

Based on remaining habitat in known cores and home ranges, about 80% of the ACs analyzed in the project area are at "high" or "moderate" risk to reproduction. In other words, most of the ACs in the project area will likely have a difficult time being reproductively successful because the core and home range isn't expected to provide enough of the resources needed to support the adults and offspring. This doesn't mean that the pairs of NSO possibly occupying these ACs will not attempt to reproduce rather reproduction success will be difficult given the current habitat conditions.

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[1] These percentages and habitat descriptions represent wildlife habitat and not necessarily the Project Vegetation Report.

The 12 ACs in the “high” risk level may be an underestimate of the ACs in poor condition because four ACs are near (<25 acres) the threshold of entering the “high” risk level. Given the potential delayed tree mortality as a result of the fire, these four ACs may enter into the “high” risk level. The “very low” risk level follows FWS (2009) recommendations based on a summary of the current research to avoid significant effects on NSO nests thus the “low”, “moderate”, and “high” contain less habitat than the “very low” risk level.

Table 15. The level of risk to NSO reproduction given the current condition of the core and home range for known activity centers

Risk to Reproduction	Number of NSO Core/Home Range
Very Low	3
Low	14
Moderate	51
High	12

Analysis Indicator 2 - Change in NSO Critical Habitat

The project area overlaps with four NSO critical habitat subunits: Klamath East 6 and 7 and Klamath West 7 and 8. Given the 2014 fire severity and pre-fire habitat, KLE6 likely lost the least amount of habitat while KLE7 likely lost the most amount of NSO critical habitat acres.

Table 16. The table displays the current number of Critical Habitat acres for Analysis Indicator 2

Critical Habitat Subunit	Critical Habitat area in Analysis Area	NSO habitat types		
		Nesting/roosting	Foraging	Dispersal
KLE6	7,696	1,996	1,579	1,381
KLE7	41,706	7,944	8,466	7,967
KLW7	26,844	2,334	6,009	7,853
KLW8	27,783	6,273	7,174	6,069

Bald Eagle

On the west side of the Forest, bald eagles are generally observed along the major rivers (Klamath, Salmon, and Scott Rivers) year-around. The project area includes a portion of the Klamath and Scott Rivers and within these portions of the rivers, four eagle nest sites and three winter roost sites are known to occur. All four nest sites have been active recently and are likely to continue to be active.

Although the 2014 fires burned large areas, only two of the four nest sites were burned. One eagle nest near Seiad Valley and one nest near Hamburg had a mix of fire severity in the near area of the nest site. Although fire can kill the nest tree, a dead tree can continue to support a nest for many years. The winter roost sites are less predictable because the eagles don't appear to have a dedicated tree or clump of trees rather a general area. The four nest sites contain about 322, 244, 354, 197 acres of trees large enough to support a future nest, if a tree presented the desired characteristics.

Northern Goshawk

Eleven goshawk nests have been occupied at some point in the last twenty years within or near the project area. All eleven nests have been affected by the 2014 fires, but the level of effects to habitat is variable. Consequently, only one of the eleven nests meets the Forest Plan Standard and Guide (pg. 4-29) habitat minimums. Unlike most of the nests, this nest is mostly outside the fire perimeter and received only small changes in habitat abundance.

Fisher, Marten, and Wolverine

Fisher: Fishers appear to be common on the westside of the forest and there have been many observations of fisher near or within the project area over the last 20 years. General surveys have been conducted on the west side of the Forest using baited trip cameras and baited 35mm camera stations; positive detections have been made at many of the stations on Scott River, Oak Knoll and Ukonom Districts. An on-going fisher genetic study on federal and non-federal ownerships has detected several fishers near or within the project area. Incidental sightings of fisher have also occurred on the Forest mostly along major roads and highways associated with rivers or large creeks, but no den sites have been located despite the certainty of reproduction occurring on the Forest. Most fisher detections on the Forest have been located in mid-late seral true fir, mixed conifer and mixed conifer-hardwood habitats.

Fisher in the project area likely occupy a more diverse mix of conifer types and tree species (e.g., Klamath mixed conifer, Douglas-fir, true firs, mixed oak-pine, ponderosa pine) than is found in the northern portion of the species range. Habitat may include mixed conifer-hardwood and pure hardwood plant communities. The entire fisher analysis area is about 382,000 acres of which about 58,300 acres is private land. Prior to the 2014 fires, the analysis area contained about 170,000 acres of high canopy cover (≥50% canopy cover) forested habitat typically associated with denning and resting sites and about 156,000 moderate canopy cover (20-49% canopy cover) that would provide enough cover for fisher to move through the home range between high quality habitat patches. There is approximately 85,610 acres of fisher denning/resting habitat that was affected by the 2014 fires in the analysis area, but about 54,680 acres of the fire affected habitat are anticipated to function similarly to pre-fire condition since the fire severity was low. Therefore, the analysis area currently contains about 139,070 acres of denning/resting habitat and about 145,740 acres of moderate canopy cover habitat.

Wolverine: Despite many attempts with camera traps, wolverines have not been detected on the Forest for several years. The last recorded observation was in the early 1980's according to California Department of Fish and Wildlife database. There are sixteen documented detections of wolverines on the Klamath National Forest but no den sites or evidence of reproduction. The lack of recent detection may be related to a lack of wolverines or the elusive nature of the species. Regardless of whether wolverines currently occur on the Forest, habitat does exist in the project area. Surveys for wolverines have not been conducted within the Project Area recently, but given the relatively high human occurrence in the project area and roads, it is unlikely wolverine would be observed. However, it is possible that a wolverine may disperse through the project area to reach the patches of higher elevation habitat (i.e. Wildernesses) or occupy the roadless areas within the project area. Given the lack of habitat information of the wolverine in California and differences in habitat between California and most study sites that occur in Canada and Rocky Mountains, we are assuming that wolverines, if present on the west-side of the Forest, would overlap marten and fisher elevation range and habitat in order to have enough habitat to create a home range. Therefore, we are assuming the wolverine are present in the project area and is using the same basic habitat as the fisher.

Marten: The distribution of marten on the west side of the Klamath is not well known due to the lack of consistent and reliable observations. Surveys for forest carnivores have been described above (see fisher), but marten have not been detected at any of the survey stations to date. California Department of Fish and Wildlife has one marten observation record from the 1970's in the project area. Incidental sightings of marten have been recorded on the Salmon River District, but these observations are likely fisher. On the east side of the Forest, marten have been identified using camera survey stations on the Goosenest Ranger District in true fir habitats near 7,000 feet in elevation. Marten are not likely to occur in the project area, but habitat does exist at higher elevations (>4,500 feet) in the project area and for purposes of this project analysis, we are assuming marten are present >4,500 feet elevation.

Table 17. Acres of fisher, marten, and wolverine habitat

Species	Denning/resting	Foraging	Movement
Fisher and Wolverine	106,397 acres	32,730 acres	135,120 acres
Marten	44,249 acres	8,500 acres	38,870 acres

<u>Analysis Indicator 1 – Habitat Connectivity</u>

For this analysis, 67 watersheds were analyzed. The 2014 fires removed many acres of habitat which likely affected habitat connectivity, but the purpose of the analysis is to analyze the current condition and the potential effects of each alternative may have on the current condition. Of the 67 watersheds analyzed, none of watersheds have high habitat connectivity. This seems reasonable given the number of naturally occurring openings occurring in the project area. Almost half (30 watershed) of the watersheds have moderate connectivity while the remaining 37 watersheds have low or very low habitat connectivity. The reason for the large number of watersheds with low or very low connectivity is partly related to the 2014 fires, but other factors such as the Klamath River (e.g. Schutts Gulch) and past fires create large openings in a given watershed.

<u>Analysis Indicator 2 – Fisher Home Range</u>

The 67 watersheds analyzed for this project had only 25 watersheds with enough habitat to support a home range or contribute to a home range. The remaining 42 watersheds have too many open areas or didn't have enough denning/resting and foraging habitats. Many of the open area acres were created by the 2014 fires.

Townsend's bat, Pallid bat, and Fringed Myotis

The project area contains no known bat hibernaculum or maternity roost sites. The Forest database and California Department of Fish and Wildlife don't have any records of these three sensitive species. However, bats may use open buildings, bridges, mines, or caves. There are a few bridges in the project area that may provide the structure for a bat roost, but no bats have been recorded in the area of these bridges. The project area contains many old mines with varying amounts of collapse, but there are several mines with enough space for a bat roost. Likewise, there are several caves in the project area that provide an opening for a bat roost, but many of these caves don't provide the micro-climate conditions that are associated with known bat roost sites. Although the occurrence of a bat hibernaculum or maternity roost is unlikely to occur in the project area, cave and cave like structure provide the opportunity for bat use. In the analysis area, there are 58 sites identified containing a cave, mine, or the potential to contain either of these structures.

Willow flycatcher

The distribution and amount of willow flycatcher reproduction is not well known on the Forest, but reproduction is possible. We are assuming that flycatchers are present on the Forest and reproduction is most likely to occur in riparian reserves in generally 3rd order or larger waterways. Although many acres of riparian habitat was burned at high severity by the 2014 fires, the larger waterways have relatively mild fire effects. Observations of the drainages that received a greater amount of high severity fire had patches of willow habitat consumed by the fire while other areas were lightly fire affected. Generally, the effect of fire on potential willow flycatcher is mixed and patchy in most areas while completely removing habitat in a few areas.

Siskiyou Mountains salamander

The Siskiyou Mountains salamander has a narrow species range and about 25% of its' range overlaps the Happy Camp project area subunit. There are 48 known sites within the project area and many of these sites occur in areas with smaller sized talus with dense conifer canopy cover that creates cool, moist conditions. Most of these sites have experienced high and moderate severity fire from the 2014 fires that removed all or most of the tree canopy cover. The lack of canopy will likely create conditions at the sites that are hotter and drier. The change in temperature and moisture will likely make conditions difficult for the salamanders to persist, but any vegetation and large woody debris may offset these conditions. These sites have not been surveyed after the fire, but it is likely that these sites are still occupied.

Tehama chaparral snail

The Tehama chaparral snail is not common on the Forest, but it has been found in talus habitat with conifer or hardwood tree canopy cover. There are three known sites in the project area. Generally, the known sites inside and outside the project area are located on southerly aspects close to riparian areas. The area outside the riparian areas around the known sites is much drier and the riparian areas are likely important for this species. However, the general area that appears to fit the habitat description best burned mostly at low and moderate severity in the riparian area during the 2014 fire. Given this species possible association with riparian habitat, the species may have pockets of remaining high quality habitat.

Western bumble bee

The western bumble is likely to occur over much of the Forest. However, the species has only been incidentally observed on the Forest. The actual distribution of the bee on the Forest is not known. Although the species is not exclusively associated with meadows, there is a strong relationship with the habitat needs and meadows. Meadows can occur on the Forest at almost any elevation possible, but the majority of the meadows in the project area occur above 4,000ft in elevation. The elevation range and the differences in aspect can provide bumble bees with a diversity of flowering plants.

Environmental Consequences

Alternative 1

Direct Effects and Indirect Effects

Fire is a natural process that can be beneficial for a diverse ecosystem, but large fire events with high severity fire can be devastating for particular wildlife species; late-successional associated forest sensitive species such as fisher, marten, wolverine, and Siskiyou mountain salamander can be greatly affected by the loss and fragmentation of habitat due to fire. The 2014 fires on the Forest affected large areas of late-successional habitat; now these burned areas pose a threat of another high severity fire as fuels accumulate. Alternative 1will not reduce the risk of future high severity fire. The burned area will continue to accumulate fuels as dead trees begin to fall to the ground. These accumulated fuels will create conditions for fire that are very difficult to manage or suppress. The likelihood of additional habitat being lost to fire is high.

Other sensitive species such as the fringed myotis, Townsend’s big eared bat, and pallid bat may have some benefit with the no action alternative in the short-term. The retention of large amount of snags could potentially provide additional day roost sites thus possibly increasing the area available for foraging. In the long-term, these snags will not persist and the possible benefit may be reduced.

Alternative 1 will have no direct effects on Forest sensitive species. However, since the habitat remaining in the project area is susceptible to another high severity fire which will likely lead to more habitat being lost to fire, there are indirect effects. Although fire-created snags are beneficial for some wildlife species, the Forest sensitive species considered for this analysis are not likely to gain much benefit.

Northern Spotted Owl

Many of the NSO nest sites in the project area have been affected by the 2014 fires resulting in the removal of habitat or reduction in habitat quality. These changes in habitat will possibly result in some NSO pairs moving their nest site a short distance to better habitat or the nest site may no longer be reproductively active. NSO may return to the nest site the year following the fire even though the fire has in many cases removed the high quality habitat and left behind burned snags as a result of high severity fire. These high severity burned snag patches provide some physical structure (standing dead trees) for NSO to possibly move from one patch of habitat to another, but these areas don't provide any canopy cover which is thought to provide cover to avoid predation. However, moderately fire affected pre-fire foraging habitat still provides a mix of live canopy cover and small openings that is likely used by NSO particularly nest sites that may be deficient in foraging habitat. Although, research hasn't provided a clear understanding on how NSO may use fire affected habitat and the possible tradeoffs in survival and reproduction, we have included fire affect nesting/roosting and foraging habitat in this analysis.

The risk to reproduction analysis indicator is intended to be a relative measure of possible effects resulting from the project. This measure is based on the amount of existing habitat minus any habitat that might be removed or downgraded by the treatments. Alternative 1 will not affect any NSO habitat. All the ACs (All ACs were affected by the fires) analyzed in this project will continue to accumulate fuels resulting from the burned trees falling over. Regeneration of habitat will likely take more than 100 years to develop into high quality NSO habitat as long as high severity fire doesn't interrupt forest development. The slow habitat development is especially difficult for the 14 (ACs in the high risk to reproduction level) or more ACs that were heavily affected by the fire and the habitat is highly unlikely to provide the needs for reproducing NSO. The moderate level of risk to reproduction will also likely have difficulty reproducing because even though the home range contains a fair number of suitable habitat acres, the habitat has been fragmented by the fire thus creating conditions where NSO may need to travel longer distances or cross non-habitat that is likely to affect survival and/or reproduction.

NSO critical habitat overlaps a large portion of the 2014 fires and consequently, a large number of critical habitat acres were burned at high severity. The loss of critical habitat is often coinciding with the loss of the better NSO habitat. Alternative 1 will not affect NSO critical habitat. The lack of treatment will retain all the remaining habitat and important legacy structures to aid in the development of NSO habitat by providing physical structure as the stand regenerates. Since NSO and their prey rely on these structures to fulfil their needs for survival and reproduction, the maintenance of large trees and large woody debris will increase the quality of future NSO habitat. However, the lack of treatment will not aid in reducing fuels to increase the potential of these areas to naturally regenerate without interruptions of high severity fire.

The lack treatment also results in a lack of tree planting. NSO have lost a large part of their habitat on the Forest as a result of the 2014 fires. Planting can play an important part in expediting the forest regeneration and NSO critical habitat. The combination of tree planting and fuels treatments are likely to decrease the amount of time needed for NSO habitat regeneration.

<u>Bald Eagle</u>

The eagle nests that may be affected by this project will likely continue to provide nesting opportunity without treatment. The lack of treatment will have no effect on disturbing nesting eagles in the short- or long-term. The current nesting tree will likely continue to stand, but other possible nesting trees are available near the current nest site thus no action will result in no effect on future possible nest trees. In the long-term, the nest tree may still be standing, but other possible nest trees will be available.

<u>Northern Goshawk</u>

The eleven goshawk nests that may be affected by this project have been affected by the fire which has resulted in most of the nests having a low amount of habitat. Only one nest (Sixmile) has sufficient habitat to have a low level of risk to reproduction while the remaining ten nests have moderate or high risk levels. Without treatment, these ten nests will continue to struggle supporting reproduction and for the high risk nests, reproduction is not likely. Over the long-term, the highly fire affected habitat will remain in poor condition and will not provide habitat.

The no action alternative will not disturb any of the goshawk nests. Any active nests in the project will not be disturbed by heavy equipment and increased road activity. In the long-term, the lack of disturbance is expected to continue without action.

Table 18. Level of risk to goshawk reproduction for Alternative 1

Nest name	Level of Risk to Reproduction
Beaver	Moderate
China	Moderate
Elk	High
Hickory	Moderate
Kelsey	Moderate
Kohl	High
Middle	High
Sixmile	Low
Stanza	High
West Whites	Moderate
Woodchopper	High

Fisher, Marten, and Wolverine

Fisher, marten, and wolverine are forest dependent species that are strongly associated with older forests with dense canopy cover. The fires occurring in 2014 removed a large portion of this habitat on the Forest thus reducing the number of home ranges for these species. Unfortunately, the loss of habitat is likely to continue with the next fire thus continuing to set back the development of forested habitat. The high severity burned forest is not likely to provide much use by these species since most of the vegetation cover has been removed. A lack of overhead cover resulting from the fire is likely to obstruct the movements of fisher and marten, but as the snags start to fall over along with shrub growth, the area may provide enough physical structure for fisher and marten to move across these openings. The loss of cover will affect marten and fisher much more than wolverine.

Although tall shrubs and woody debris may provide structure for fisher and marten to move across openings, one of the most important factors for fisher and marten home ranges is sufficient denning/resting habitat. Denning/resting habitat affected by the fires will take many years to regenerate so any additional assistance to speed up the process will likely help. In the short-term, protection of existing denning/resting habitat from future high severity fire is important to conserve viable home ranges. Unfortunately, Alternative 1 will not help to speed up the regeneration or protect existing habitat. The large amount of fuels created by the 2014 will continue to accumulate and will create conditions that will increase the likelihood of future high severity fire possibly threatening more denning/resting habitat and increase fragmentation of home ranges. Therefore, alternative 1 will not affect the habitat connectivity for these species or the amount of habitat needed for a fisher home range.

Table 19. Current level of fisher, marten, and wolverine habitat connectivity (analysis indicator 1)

Level of Habitat Connectivity	Number of 7th field watersheds
High	0
Moderate	30
Low	16
Very Low	21

<u>Townsend's bat, Pallid bat, and Fringed Myotis</u>

The 2014 fires likely affected many of the potential maternity or winter roost sites by removing the vegetation near the opening of these possible sites. The removal of vegetation wouldn't affect the site directly, but the loss of vegetation could change the air flow in a maternity or hibernacula and subsequently micro-site conditions that may result in the loss of the site functionality. Bats need specific micro-site conditions (e.g. temperature and humidity) for a cave or cave like structure to be a maternity or hibernacula and any change in those conditions could result in the site becoming too cold to raise their offspring or rest during the cold months.

The fire created an abundant source of snags with cavities that provide possible day roost sites. These sites are important for foraging bats. Any roost sites that retained the micro-climate condition necessary to support a hibernacula or maternity will continue to provide those services. For Alternative 1, the lack of action will not affect bats. The rate of forest regeneration will be slow without treatment, but bats will be able to continue to use the abundant source of snags. The lack of disturbance created by treatment will maintain any hibernaculum or maternity sites. Therefore, for analysis indicator 1, the risk of disturbance is no effect.

<u>Willow Flycatcher</u>

The willow flycatcher is more dependent on live riparian vegetation and the loss of this vegetation is likely to affect the number of possible areas for nesting. Alternative 1 will not change the current condition of the habitat. The flycatcher will continue to use the remaining areas of habitat, if present. Burned forest is likely not beneficial to flycatchers so the retention of these features will likely not affect this species. In the long-term, the habitat will regenerate and possibly produce willow or alder patches for flycatchers. For analysis indicator 1, the lack of action will have no effect on risk to habitat alternation.

Siskiyou Mountain salamander

The Siskiyou Mountain salamander needs cool, moist talus habitat typically created by dense conifer canopy on northerly slopes. Alternative 1 will not change the current habitat condition. The moderate and high severity burned habitat is likely to have little to no canopy cover, but the small amount of canopy cover will be retained in this alternative. In addition, the talus habitat will not be disturbed by implementation activity that may compact the talus. These salamanders rely on the small spaces between the pieces of talus to move deeper or shallower in the talus profile to reach desired temperature and moisture. Salamanders that aren't able to find cool, moist conditions will likely die. For analysis indicator 1, the risk of habitat disturbance is no effect.

Tehama Chaparral Snail

The Tehama chaparral snail appears to be associated with talus in conifer and hardwood mixed habitat near riparian reserves. Alternative 1 will not affect any habitat in project area. The species will likely have some patches of habitat where canopy cover and micro-site conditions will provide for the needs of several individuals. The existing woody debris which will likely be supplemented by the abundant dead trees will provide small areas of possible refugia for dispersing snails. The lack of habitat disturbance will also help any remaining habitat to continue to provide future habitat when canopy cover regenerates. For analysis indicator 1, there is no effect on the likelihood of snails dispersing.

Western Bumble Bee

There is almost 4,000 acres of meadow habitat in the project area with varying fire severity resulting from the 2014 fires. According the burn severity data, most of the meadows burned at low severity thus it is likely that many of the meadows contain some vegetation which may provide basic structure for a nest site. The areas that burned at moderate severity or less are likely to produce flowering plants this spring. Alternative 1 will not affect bumble bee habitat. The existing meadow habitat will provide nesting and foraging opportunity for the bees. The retention of snags will not affect the ability of bumble bees to survive or reproduce. For analysis indicator 1, there will be no effect on bumble bee nest disturbance.

Cumulative Effects

Alternative 1 will have indirect effects on northern spotted owl. The lack of treatment will affect the rate of habitat development and risk of future high severity fire consuming more habitat thus risking reproduction of spotted owl. These indirect effects were measured through analyzing the current conditions qualitatively so the cumulative effects analysis is measuring the effects resulting from other project for this analysis indicator. The addition of direct, indirect, and cumulative effects will result in no shift in risk to reproduction. The cumulative effects didn't affect enough habitat to shift the risk level for any of the ACs in the analysis area.

For analysis indicator 2, the addition of direct, indirect, and cumulative effects will result in several acres of habitat being affected. Like analysis indicator 1, direct and indirect effects were measured through analyzing the current conditions qualitatively so the cumulative effects analysis is measuring the effects resulting from other project for this analysis indicator. The result of the cumulative effect is about 552 acres of critical habitat in subunit KLE7. The remaining three subunits have no cumulative effects for this analysis indicator.

Alternative 1 will have indirect effects on the risk on the level of fisher, marten, and wolverine habitat connectivity. The lack of treatment will affect the rate of habitat development and risk of future high severity fire consuming more habitat resulting in more fragmented habitat that will negatively affect habitat connectivity. These direct and indirect effects were indirectly measured through analyzing the current conditions qualitatively so the cumulative effects analysis is measuring the other project effects on the analysis indicator. The addition of direct, indirect, and cumulative effects will result in at least one watershed (Dutch Creek) not providing enough habitat connectivity within the watershed. Therefore, Dutch Creek will be difficult cross due to the large gaps in habitat and may influence survival, especially marten and fisher.

Alternative 1 will have indirect effects on the risk on fisher home range. The lack of treatment will affect the rate of habitat development and risk of future high severity fire consuming more habitat will affect the number of potential fisher home ranges. These direct and indirect effects were indirectly measured through analyzing the current conditions qualitatively so the cumulative effects analysis is measuring the other project effects on the analysis indicator. The addition of direct, indirect, and cumulative effects will result in at least one watershed (Big Ferry-Swanson) not providing enough habitat to support a fisher home range.

Action Alternatives

NORTHERN SPOTTED OWL

Alternative 2

Direct and Indirect Effects

All the known ACs within the analysis area will have some type of treatment in the home range, but the level of effects will vary. For analysis indicator 1, a “very low” risk is desired, but only three AC met the “very low” criteria before treatment and alternative 2 will not affect these AC’s risk level. None of the ACs in “low” increased in risk level, but one AC did increase in risk level from “moderate” to “high”. The “high” risk level can’t increase in risk despite changes in habitat acres.

Alternative 2 will result in the removal of critical habitat within all four NSO critical habitat subunits. The estimate of the change in critical habitat is likely an over estimate for the loss of habitat, but the magnitude is difficult to estimate since delayed tree mortality is dependent on future site conditions. Several salvage units have a mix of fire effects on NSO habitat resulting in some units containing pockets of NSO habitat. Although the project is using a 70% probability of mortality to identify trees for harvest in the treatment units, many of these trees that meet this definition are mixed with trees with lower probability of mortality thus contributing to canopy cover to the extent that these areas still meet the description of NSO habitat.

Roadside hazard tree treatment will remove trees that pose a risk to human safety including fire affected trees and trees not affected by fire but meet the tree hazard guidelines. Despite the prescription of only removing trees that meet the hazard criteria or probability of tree mortality, the removal of live trees will reduce canopy cover among other habitat characteristics. In addition, fuels treatments will remove much of the understory in portions of the roadside treatment resulting in lowering the overall quality of the habitat. However, not every acre of roadside hazard treatment contains habitat and not every acre of habitat receiving roadside hazard treatment will result in a change in habitat.

Overall, the amount of NSO critical habitat has been on a decline primarily because of large fire events that resulted in removing many acres of habitat. The 2014 fires added to this negative trend in the amount and quality of NSO critical habitat. The additional removal of NSO critical habitat from alternative 2 will continue this negative trend. Even though there is no defined minimum threshold for NSO critical habitat that would aid in determining the magnitude of effects, KLE7 is likely the most affected critical habitat subunit from fires in the last few decades in the project area and the proposed treatments will further affect some of the remaining habitat (Table 20).

Table 20. Change in Critical Habitat Acres for Alternative 2 (Analysis Indicator 2)

Critical Habitat Subunit	Critical Habitat area in Analysis Area	Change in NSO Critical Habitat from Current Condition		
		Nesting/roosting (ac)*	Foraging (ac)*	Dispersal (ac)*
KLE6	3,362	-5	0	-3
KLE7	36,408	-45 (-125)	-120 (-283)	-39 (-339)
KLW7	21,978	-84	-245	-196
KLW8	22,715	-322	-67 (-77)	-79
Total	84,463	Loss of 456 (-536)	Loss of 432 (-605)	Loss of 317 (-617)

* The acres presented in the parentheses are the acres removed by the alternative and cumulative effects combined

Cumulative Effects

The direct and indirect effects of alternative 2 plus cumulative effects resulting from other actions within the analysis area did not change the risk level for any of the ACs. Generally, the ACs with many acres of cumulative effects were identified with a “high” risk level thus the cumulative effects can only increase the risk level and there is no risk level above “high”.

For analysis indicator 2, the cumulative effect will result in additional acres of critical habitat being removed. The direct and indirect effect of this alternative (about 1,205 acres of NRFD) plus the cumulative effect (about 553 acres of NRFD) from other projects will remove about 1,758 acres of critical habitat (NRFD) totaling about 2% of the NRFD for the portion of critical habitat in the analysis area.

Alternative 3

Direct and Indirect Effects

Alternative 3 deferred treatment for several small salvage units scattered in the project area including the Beaver project area subunit. Interestingly, the deferment for those few units affected 6 ACs by maintaining the "moderate level" despite treatments as compared to alternative 2. Although each AC is important for NSO recovery, the "very low" and "low" ranked ACs are likely more important because they contain enough habitat to support reproduction. The maintenance of these 6 ACs is good, but these AC may not have enough habitat to support reproduction regardless of treatment.

The effects of alternative 3 on critical habitat are similar to alternative 2 except fewer acres of critical habitat will be removed. The potential effect on current and future critical habitat is very similar to alternative 2.

Table 21. Change in Critical Habitat Acres for Alternative 3 (Analysis Indicator 2)

Critical Habitat Subunit	Critical Habitat area in Analysis Area	Change in NSO Critical Habitat from Current Condition		
		Nesting/roosting (ac)*	Foraging (ac)*	Dispersal (ac)*
KLE6	3,362	-5	0	-3
KLE7	36,408	-45 (-125)	-120 (-283)	-39 (-339)
KLW7	21,978	-84	-245	-196
KLW8	22,715	-322	-67 (-77)	-79
Total	84,463	Loss of 456 (-536)	Loss of 432 (-605)	Loss of 317 (-617)

* The acres presented in the parentheses are the acres removed by the alternative and cumulative effects combined

Cumulative Effects

The direct and indirect effects of alternative 3 plus cumulative effects resulting from other actions within the analysis area shifted the 6 ACs that were maintained with only considering the alternative 3 actions.

For analysis indicator 2, the cumulative effect for this alternative will result in the same effect as alternative 2. The direct and indirect effect of this alternative (about 1,205 acres of NRFD) plus the cumulative effect (about 553 acres of NRFD) from other projects will remove about 1,758 acres of critical habitat (NRFD) totaling about 2% of the NRFD for the portion of critical habitat in the analysis area.

Alternative 4

Direct and Indirect Effects

For analysis indicator 1, the resulting level of risk to reproduction is the same as alternative, but there are differences in acres of habitat affected.

The effects of alternative 4 on critical habitat are similar to alternative 2 except fewer acres of critical habitat will be removed. The direct and indirect effect of this alternative (about 1,179 acres of NRFD) plus the cumulative effect (about 553 acres of NRFD) from other projects will remove about 1,732 acres of critical habitat (NRFD) totaling about 2% of the NRFD for the portion of critical habitat in the analysis area.

Table 22. Change in Critical Habitat Acres for Alternative 4 (Analysis Indicator 2)

Critical Habitat Subunit	Critical Habitat area in Analysis Area	Change in NSO Critical Habitat from Current Condition		
		Nesting/roosting (ac)*	Foraging (ac)*	Dispersal (ac)*
KLE6	3,362	-5	0	-3
KLE7	36,408	-45 (-125)	-109 (-272)	-24 (-324)
KLW7	21,978	-84	-245	-196
KLW8	22,715	-322	-67 (-77)	-79
Total	84,463	Loss of 456 (-536)	Loss of 421 (-594)	Loss of 302 (-602)

* The acres presented in the parentheses are the acres removed by the alternative and cumulative effects combined

Cumulative Effects

The direct and indirect effects of alternative 4 plus cumulative effects resulting from other actions within the analysis area resulted in similar effects described in alternative 2 cumulative effects.

For analysis indicator 2, the cumulative effect for this alternative will result in additional acres of critical habitat being removed, but fewer than alternative 2. The direct and indirect effect of this alternative (about 5,709 acres of NRFD) plus the cumulative effect (about 556 acres of NRFD) from other projects will remove about 6,265 acres of critical habitat (NRFD) totaling about 6% of the NRFD for the portion of critical habitat in the analysis area.

Alternative 5

Direct and Indirect Effects

Alternative 5 had the least amount of habitat affected among the action alternatives. However, the risk level was very similar to alternative 2. Alternative 5 maintained one more AC in the “moderate” risk level compared to alternative 2. The effects of alternative 5 on critical habitat are similar to alternative 2.

Table 23. Change in Critical Habitat Acres for Alternative 5 (Analysis Indicator 2)

Critical Habitat Subunit	Critical Habitat area in Analysis Area	Change in NSO Critical Habitat from Current Condition		
		Nesting/roosting (ac)*	Foraging (ac)*	Dispersal (ac)*
KLE6	3,362	-5	0	-3
KLE7	36,408	-45 (-125)	-120 (-283)	-39 (-339)
KLW7	21,978	-84	-245	-196
KLW8	22,715	-322	-67 (-77)	-79
Total	84,463	Loss of 456 (-536)	Loss of 432 (-605)	Loss of 317 (-617)

* The acres presented in the parentheses are the acres removed by the alternative and cumulative effects

Cumulative Effects

For analysis indicator 2, the cumulative effect for this alternative will result in the same effect as alternative 2. The direct and indirect effect of this alternative (about 1,205 acres of NRFD) plus the cumulative effect (about 553 acres of NRFD) from other projects will remove about 1,758 acres of critical habitat (NRFD) totaling about 2% of the NRFD for the portion of critical habitat in the analysis area.

Summary of Effects by Analysis Indicators

Table 24. The number of NSO nests within each level of risk to reproduction (Analysis Indicator 1)

Risk to Reproduction	Current Condition	Alternative 2	Alternative 3*	Alternative 4	Alternative 5
Very Low	3	3	3	3	3
Low	14	14	14	14	14
Moderate	51	50	50	50	50
High	12	13	13	13	13

Table 25. Change in NSO Critical Habitat (Analysis Indicator 2)

Alternatives	NSO Critical Habitat Removed by Habitat Type		
	Nesting/roosting (ac)	Foraging (ac)	Dispersal (ac)
Alternative 2	456 (-536)	432 (-605)	317 (-617)
Alternative 3	456 (-536)	432 (-605)	317 (-617)
Alternative 4	456 (-536)	421 (-594)	302 (-602)
Alternative 5	456 (-536)	432 (-605)	317 (-617)

* The numbers presented in the table represent the effects for each alterative and the parentheses present the number of ACs within the particular level of risk given the direct, indirect, and cumulative effects.

BALD EAGLE

Alternative 2

Direct and Indirect Effects

Alternative 2 will have treatment within 0.5 mile all four eagle nest sites. However, only one nest site is within 1,500 feet of noise created by the proposed activities. Caroline Creek eagle nest has salvage and roadside hazard treatment within 600 feet of the nest. According to analysis indicator 1, the Caroline Creek nest site has a high risk of abandoning the nest, if active. In order to mitigate this concern, a Project Design Feature (PDF) will be used to avoid noise disturbance for all four nest sites by keeping noise producing activities far enough from the nest to avoid disturbance and/or avoid operating equipment during the nesting period. Therefore, the PDF will minimize the risk of creating noise that may result in noise disturbance.

Analysis indicator 2 examines the risk to future eagle nest sites. Ideally, eagles would have a large selection of large trees to select from in the near area of the active nest site, if a new nest tree is needed. Three of the four eagle nests have a small amount of treatment (<4 acres) that would remove potential future nest tress within the near area (defined in spatial bounds as analysis area). However, Caroline Creek eagle nest will have a large proportion of the nearby area removed of potential future nest trees. According to analysis indicator 2, Dona, Muck-A-Muck, and Frying-pan will have a low risk to affecting the future nest tree availability. Caroline Creek nest, however, will have a high risk of the eagle pair not finding a nest tree in the future, if the eagles choose to move.

Cumulative Effects

The four nest site analysis areas contain planned activities from Happy Camp Fire Protection Project, Thom Seider Project, McCollins Project, private land (Timber harvest plan 87) and Grider Creek NTMP. These activities have a PDF to minimize disturbance of the eagle nest by limiting the time period an activity can occur (outside the nesting period) or the activities are far enough from the nest to avoid disturbance. Therefore, the cumulative effect for analysis indicator 1 is no disturbance effect resulting from alternative 2 plus no additional effects of disturbance from ongoing or future projects. For analysis indicator 2, current or future activities within the analysis area total about 490 acres, but only about 10 acres of treatment are expected to result in the loss of large trees that may provide future nest trees. Therefore, the acres affected and resulting risk assessment for the Muck-A-Muck, Caroline, and Frying-pan nests will remain the same as presented above, but the Donna eagle nest will have the 3 acres affected by alternative 2 plus the 10 acres affected by other project totaling 13 acres. The additional 10 acres of treatment within the potential nest tree area for the Donna eagle nest will result in remaining at a low risk.

Alternative 3

Direct and Indirect Effects

The effects for analysis indicator 1 in this alternative are the same as described in alternative 2. The PDF will reduce the potential of disturbing nesting eagles thus the risk of disturbance is low for alternative 3. Like alternative 2, alternative 3 will have a low risk on future nesting trees for Donna, Muck-A-Muck, and Frying-pan nest sites. In this alternative, Caroline nest has fewer acres of potential nesting trees affected, but the risk is still elevated according to the analysis indicator criteria because of the number of salvage acres. However, a PDF will be used to retain additional large snags in Caroline Creek Bald Eagle Management Area to lower the risk. Even though the PDF will not resolve all the risk, the retention of additional large snags will lessen the risk to a moderate level.

Cumulative Effects

The cumulative effects are the same for alternative 3 as in alternative 2 except that Caroline nest will have a reduced level of effects on potential future nest trees.

Alternatives 4 and 5

Direct and Indirect Effects

Potential disturbance for all four nest sites is low for this alternative. The risk to future nest trees is low for all four nest sites.

Cumulative Effects

The cumulative effects are the same for alternatives 4 and 5 as in alternative 2 except that Caroline nest will have a reduced level of effects on potential future nest trees.

Summary of Effects by Analysis Indicators

Table 26. Level of disturbance on known eagle nests (Analysis Indicator 1)

Nest site name	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Donna	Low	Low	Low	Low
Muck-A-Muck	Low	Low	Low	Low
Caroline	Low	Low	Low	Low
Frying-pan	Low	Low	Low	Low

Table 27. Level of risk on future nest trees for known eagle nests (Analysis Indicator 2)

Nest site name	Current habitat (acres)	Alternative 2 (acres removed)*	Alternative 3 (acres removed)*	Alternative 4 (acres removed)*	Alternative 5 (acres removed)*
Donna	197	Low (13 acres)	Low (13 acres)	Low (13 acres)	Low (12 acres)
Muck-A-Muck	322	Low (2 acres)	Low (2 acres)	Low (2 acres)	Low (3 acres)
Caroline	355	High (180 acres)	Moderate (151 acres)	Low (66 acres)	Low (12 acres)
Frying-pan	245	Low (0 acres)	Low (0 acres)	Low (0 acres)	Low (0 acres)

* The acres presented in the parentheses are the acres removed by the alternative and cumulative effects

NORTHERN GOSHAWK

Alternative 2, 3, 4, and 5

Direct and Indirect Effects

Alternatives 2, 3, 4, and 5 will have treatment within 0.25 mile of six goshawk nest sites (Kohl, Beaver, China, Elk, Middle, and Hickory). However, a Project Design Feature (PDF) will be used to avoid disturbance of these nests through the sensitive part of nesting. Therefore, alternatives 2, 3, 4, and 5 will have a low risk of disturbing known goshawk nests.

Ten of the 11 known goshawk nests (Woodchopper nest contains no activities) in the project area contain proposed activities that will remove dead or dying trees within areas considered to be no longer habitat, some of the treatment units contain fire damaged trees that still provide canopy cover and meet the description of goshawk habitat. These fire affected forest habitat acres may not persist given the fire effects on the trees and possible environmental stress thus these trees may die in the near future; however, at the time of field review of these treatment units, some areas contained characteristics of goshawk habitat.

Alternatives 2, 3, 4, and 5 will remove habitat and result in two nests (Hickory and West Whites) increasing in the level of risk to reproduction from moderate to high. Both of these nests have abundant habitat in the primary nest zone (0.5 mile radius of the nest), but the foraging zone (outside the primary nest zone 0.5 to 1.0 mile) doesn’t contain a large amount of habitat and is consequently near the moderate risk category minimum for foraging area habitat acres. Therefore, the treatment in Alternatives 2, 3, 4, and 5, although small in the number of acres of habitat removed, will result in the Hickory and West Whites goshawk nest having a high level of risk to reproduction.

In the long-term, habitat isn’t likely to return and the goshawk nests with a high risk to reproduction are likely not to be active until habitat regenerates. The China nest which has a moderate risk to reproduction may persist, but the habitat is likely to continue to degrade as trees that appear to be mildly affected by the fire possibly die from stress. The magnitude of delayed tree mortality is difficult to estimate since future environmental factors can contribute to the loss. The Sixmile nest which has abundant habitat is likely to persist since the primary nest zone and foraging zone habitat is expected to have little change from direct and indirect effects.

Cumulative Effects

The project PDF will lower the likelihood that noise generated by the project would disturb known goshawk nests for alternatives 2, 3, 4, and 5. However, one nest located on Forest has private property within 0.25 mile of the nest location. The private owner is implementing a project that may or may not provide a limited operating period for this nest thus possibly creating noise that may disturb a nesting goshawk, if present. However, this nest is not likely to be active given the substantial amount of habitat lost to a fire occurring in 2014. Almost the entire primary nest core and a large portion of the foraging zone burned at high severity thus creating conditions unfavorable for a nesting goshawk.

Ten of the 11 nests have cumulative effects within the primary nest zone or foraging zone. The Middle nest has no cumulative effects. Woodchopper nest contains no actions from this project, but it contains anticipated activities on adjacent private land that is in the foraging zone thus possibly removing a small amount (<10 acres) of low quality habitat. This nest contains a small amount of habitat and this loss of potential habitat will not result in a change in the level of risk to reproduction.

Only two nests (Beaver and Kelsey) had a change in the level of risk to reproduction as a result of cumulative effects. The Beaver is located among several pieces of private land and the anticipated amount of treatment is expected to move this nest from a moderate level to a high level of risk to reproduction. The Kelsey nest was affected by the fire and the addition of treatment in the Lovers Project will result in the risk to reproduction to move from moderate to high. The remaining 7 nests have cumulative effects but the effects were not large enough to move the level of risk to reproduction.

Table 28. Level of risk to goshawk reproduction (Analysis Indicator 2)

Nest Name	Current Rank	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Beaver	Moderate	Moderate (H)*	Moderate (H)	Moderate (H)	Moderate (H)
China	Moderate	Moderate (M)	Moderate (M)	Moderate (M)	Moderate (M)
Elk	High	High	High	High	High
Hickory	Moderate	High	High	High	High
Kelsey	Moderate	Moderate (H)	Moderate (H)	Moderate (H)	Moderate (H)
Kohl	High	High (H)	High (H)	High (H)	High (H)
Middle	High	High	High	High	High
Sixmile	Low	Low (L)	Low (L)	Low (L)	Low (L)
Stanza	High	High	High	High	High
West Whites	Moderate	High (H)	High (H)	High (H)	High (H)
Woodchopper	High	High (H)	High (H)	High (H)	High (H)

* The level of risk to reproduction is presented as Low, Moderate, or High while the cumulative effect is presented as “(H)” high, “(M)” moderate, or “(L)” low.

FISHER, MARTEN, AND WOLVERINE

Alternative 2

Direct and Indirect Effects

Alternative 2 will most notably affect 13 watersheds habitat connectivity. There are 7 watersheds that go from moderate habitat connectivity to low or very low connectivity. The remaining 6 watersheds will drop from low to very low habitat connectivity. All other watershed remained at the same level of connectivity given the effects of alternative 2.

Three (Cougar Creek-Elk Creek, Lower West Fork Beaver Creek, and Tom Martin Creek-Klamath River) of the 25 watersheds met the criteria of possibly containing or contributing to a fisher home range fell below the fisher home range threshold. These three watersheds are not likely to contain a fisher home range after treatment.

Alternative 3

Direct and Indirect Effects

The effects of alternative 3 on habitat connectivity are the same as alternative 2 except Horse Creek and Doggett Creek remained at the same level of habitat connectivity as the current condition. Therefore, effects of alternative 3 are lower than alternative 2.

The same three potential fisher home ranges represented by the Cougar Creek-Elk Creek, Lower West Fork Beaver Creek, and Tom Martin Creek-Klamath River will fall below the home range threshold like alternative 2. Therefore, these three watersheds are not likely to contain a fisher home range after treatment.

Alternative 4

Direct and Indirect Effects

Alternative 4 had only one watershed (Upper Elk Creek) that had a change in habitat connectivity compared to alternative 2. Upper Elk Creek maintained its' habitat connectivity level compared to the current condition. Therefore, the effects of alternative 4 are lower than alternative 2.

The same three potential fisher home ranges represented by the Cougar Creek-Elk Creek, Lower West Fork Beaver Creek, and Tom Martin Creek-Klamath River will fall below the home range threshold like alternative 2. Therefore, these three watersheds are not likely to contain a fisher home range after treatment.

Alternative 5

Direct and Indirect Effects

Alternative 5 had the least amount of effects to habitat connectivity among the action alternatives. Six watersheds maintained the current condition level of habitat connectivity and four of those watersheds maintained a moderate level of habitat connectivity. The moderate level of connectivity is the best connectivity existing in the project area thus it is desirable to maintain connectivity in these watersheds.

The same three potential fisher home ranges represented by the Cougar Creek-Elk Creek, Lower West Fork Beaver Creek, and Tom Martin Creek-Klamath River will fall below the home range threshold like alternative 2. Therefore, these three watersheds are not likely to contain a fisher home range after treatment.

Cumulative Effects for Alternatives 2, 3, 4, and 5

The direct and indirect effects for each of the alternatives plus the cumulative effects will result in one watershed changing in the level of habitat connectivity. Dutch Creek has a low level of connectivity and the addition of cumulative effects would result in very low connectivity.

The direct and indirect effects for each of the alternatives plus the cumulative effects will result in one watershed falling below the level of habitat needed for a fisher home range. The Big Ferry – Swanson watershed has the Singleton Project and projects on private land that will result in the loss of habitat.

Summary of Effects by Analysis Indicators

Table 29. Level of Habitat Connectivity for watersheds that had a change in connectivity for any of the alternatives (Analysis Indicator 1)

Watershed	Current Condition	Alternative 2*	Alternative 3*	Alternative 4*	Alternative 5*
Cliff Valley Creek	Moderate	Low	Low	Low	Moderate
Horse Creek	Moderate	Low	Moderate	Low	Moderate
McCarthy Creek-Scott River	Moderate	Low	Low	Low	Moderate
Tompkins Creek	Moderate	Low	Low	Low	Low
Upper Elk Creek	Moderate	Low	Low	Moderate	Moderate
Caroline Creek-Klamath River	Moderate	Very Low	Very Low	Very Low	Low
Upper East Fork Elk Creek	Moderate	Very Low	Very Low	Very Low	Very Low
Doggett Creek	Low	Very Low	Low	Very Low	Very Low
Lower East Fork Elk Creek	Low	Very Low	Very Low	Very Low	Very Low
Middle Creek	Low	Very Low	Very Low	Very Low	Very Low
O'Neil Creek	Low	Very Low	Very Low	Very Low	Low
Schutts Gulch-Klamath River	Low	Very Low	Very Low	Very Low	Low
Tom Martin Creek-Klamath River	Low	Very Low	Very Low	Very Low	Very Low

* The table only shows the results of direct and indirect effects. The cumulative effects didn’t change the level of habitat connectivity for the presented watershed.

Table 30. Watersheds that may contain a fisher home range and the result of each alternative on those home ranges (Analysis Indicator 2)

Watershed Name	Current Condition	Alternative 2*	Alternative 3*	Alternative 4*	Alternative 5*
Bear Creek	Yes	Yes	Yes	Yes	Yes
Benjamin Creek-Klamath River	Yes	Yes	Yes	Yes	Yes
Big Ferry-Swanson	Yes	Yes (No)	Yes (No)	Yes (No)	Yes (No)
Bishop Creek-Elk Creek	Yes	Yes	Yes	Yes	Yes
Buckhorn Creek	Yes	Yes	Yes	Yes	Yes
Collins Creek-Klamath River	Yes	Yes	Yes	Yes	Yes
Eddy Gulch	Yes	Yes	Yes	Yes	Yes
Fryingpan Creek-Klamath River	Yes	Yes	Yes	Yes	Yes
Granite Creek	Yes	Yes	Yes	Yes	Yes
Jackass Gulch	Yes	Yes	Yes	Yes	Yes
Jaynes Canyon	Yes	Yes	Yes	Yes	Yes
Lower Grider Creek	Yes	Yes	Yes	Yes	Yes
McCarthy Creek-Scott River	Yes	Yes	Yes	Yes	Yes
Middle Elk Creek	Yes	Yes	Yes	Yes	Yes
Shadow Creek	Yes	Yes	Yes	Yes	Yes
Sixmile Creek	Yes	Yes	Yes	Yes	Yes
Soda Creek-Beaver Creek	Yes	Yes	Yes	Yes	Yes
South Fork Kelsey Creek	Yes	Yes	Yes	Yes	Yes
Sugar Creek	Yes	Yes	Yes	Yes	Yes
Upper Grider Creek	Yes	Yes	Yes	Yes	Yes
Whites Gulch	Yes	Yes	Yes	Yes	Yes
Yellow Dog Creek-North Fork Salmon River	Yes	Yes	Yes	Yes	Yes
Cougar Creek-Elk Creek	Yes	No	No	No	No
Lower West Fork Beaver Creek	Yes	No	No	No	No
Tom Martin Creek-Klamath River	Yes	No	No	No	No

* The change in fisher home range is presented as "Yes" to identify the watershed with a potential home range and "No" to identify the watershed not containing the habitat for a home range. The "(No)" is identifying the cumulative effects as the watershed no containing enough habitat for home range given the direct, indirect, and cumulative effects.

PALLID BAT, TOWNSEND'S BIG-EARED BAT, AND FRINGED MYOTIS

Alternative 2, 3, 4, and 5

Direct and Indirect Effects

All the action alternatives have similar direct and indirect effects for analysis indicator 1. About 75% of the sites will have low or moderate risk of disturbing a possible bat maternity or hibernacula. Given the time period when treatment is most likely to occur (summer and fall months), treatment is not likely to disturb a possible hibernacula. The treatments may disturb a maternity because maternities are active from about April to August, but are most sensitive during the early spring when the offspring are not capable of flight. Although unlikely, the 15 watersheds with moderate risk of disturbance could affect a maternity, but more realistically, treatment >250 feet is only likely to disrupt foraging bats. Therefore, the sites with potential cave or cave like structures in the 13 sites with a high risk of disturbance are likely the most vulnerable to abandonment which could affect a population. Maternities are not common because bats need specific cave environment conditions and although there are several possible caves or cave like structures, very few meet the criteria.

Table 31. The number of bat sites with low, moderate, and high risk of disturbing a bat maternity or hibernacula (Analysis Indicator 1)

Risk of Disturbance	Alternative 2*	Alternative 3*	Alternative 4*	Alternative 5*
High	13 (24)	13 (24)	12 (23)	13 (24)
Moderate	15 (12)	15 (12)	15 (12)	14 (23)
Low	30 (22)	30 (22)	31 (23)	31 (11)

* The numbers in the parentheses are the number of watersheds within each level of risk reflecting the direct, indirect, and cumulative effects

Cumulative Effects for Alternatives 2, 3, 4, and 5

The direct and indirect effects for each of the alternatives plus the cumulative effects will result in about doubling the number of sites with a high risk of disturbing bats. The majority of this effect is because of the uncertainty of mitigations occurring on non-Forest Service land. Therefore, the cumulative effects may be an overestimate especially, if non-Forest Service lands are attempting any mitigation.

WILLOW FLYCATCHER

Alternative 2, 3, 4, 5

Direct and Indirect Effects

The direct and indirect effects on willow flycatcher habitat is low for most (70%) of the 7th field watersheds in the analysis area. Most of the effects were as a result of fuels treatments in the riparian reserve and site prep outside of plantations. These treatments have almost the same footprint for watersheds identified as “low” and “moderate” level of habitat alternation, but in alternative 5, there are additional treatments that would possibly affect riparian habitat, but these watersheds had a “high” level of habitat alteration despite the alternative. Therefore, the number of watershed within each of the levels of habitat alteration didn’t change between action alternatives.

Table 32. The number of watersheds with low, moderate, and high level of willow flycatcher habitat alteration (Analysis Indicator 1)

Level of Habitat Alteration	Alternative 2, 3, and 4*	Alternative 5*
Low	48 (44)	48 (44)
Moderate	3	3
High	17 (21)	17 (21)

* The number in the parentheses represents the number of watersheds with each level based on direct, indirect, and cumulative effects.

Cumulative Effects for Alternatives 2, 3, 4, and 5

The direct and indirect effects for each of the alternatives plus the cumulative effects will result in four watersheds shifting from low to high level of habitat alteration. The effects for these four watersheds may be an overestimate because most of the cumulative effects are being occurring on non-Forest lands and these areas may be managed differently from the Forest. Therefore, any mitigation on non-Forest Service land would lessen the cumulative effects.

SISKIYOU MOUNTAIN SALAMANDER

Alternative 2, 3, 4, 5

All the action alternatives have a similar level of effects on salamander habitat disturbance. Not all disturbances are equal. Tractor will likely compact the most amount of salamander habitat followed by cable yarding corridors where several logs are basically dragged over the same ground. Overall cable yarding will likely affect fewer acres of talus habitat and likely create much less heavily compacted areas. There are 19 known salamander sites in treatment units that are expected to create ground disturbance. In order to minimize impacts to these known sites, a project design feature (PDF) will be used to buffer the site and maintain live or dead trees within the buffer. Therefore, given the PDF, the level of risk for disturbing known sites is low.

Cumulative Effects for Alternatives 2, 3, 4, and 5

The direct and indirect effects for each of the alternatives plus the cumulative effects will result in four known sites occurring in non-Forest Service projects may be affected. Given the direct, indirect, and cumulative effect for analysis indicator 1, the level of risk disturbing a known site is low. This may be an overestimate of effects if mitigations are used on the non-Forest Service projects.

TEHAMA CHAPARRAL SNAIL

Alternative 2, 3, 4, 5

All action alternatives have similar effects on Tehama chaparral snail dispersal. These snails likely need some type of physical structure to provide cooler and moisture conditions during dispersal and this is likely more important for snails dispersing across areas without canopy cover. A few project design features will provide woody debris after treatment. Since snails can use varying size of woody debris that is basically ≥12in in diameter, the treatment units should have sufficient woody debris despite the fuels treatments. In addition, PDFs will retain live and dead trees in the treatment units to provide future woody debris and the known sites will not be treated to retain any remaining habitat. Therefore, given the project PDFs, the analysis indicator 1 will be a high likelihood of dispersal for alternative 2, 3, 4, and 5.

Cumulative Effects for Alternatives 2, 3, 4, and 5

The direct and indirect effects for each of the alternative plus the cumulative effects will result in the same three known sites considered for direct and indirect effects with no addition of cumulative effects. All known sites in the project area don’t overlap with any other project.

WESTERN BUMBLE BEE

Alternative 2, 3, 4, 5

All action alternatives have similar effects on the level of disturbance on the western bumble bee. Although, treatment isn’t likely to occur in wet meadows, there are several meadows that may not be wet. In order to capture the potential effects of each alternative, any meadow occurring in the treatment unit may be disturbed by implementation of the project. Given this situation, there are five watersheds with possible disturbance occurring at a high level. In addition there are five watersheds possibly creating moderate level of disturbance.

Table 33. The watersheds with moderate and high level of bumble bee habitat disturbance for either direct and indirect or cumulative effects (Analysis Indicator 1)

Watershed	Alternative 2, 3, 4, and 5	Cumulative Effects for Alternative 2, 3, 4, and 5
Buckhorn Gulch-Beaver Creek	Low	Moderate
Kohl Creek	Low	Moderate
Dutch Creek	Low	Moderate
China Creek	High	High
Cliff Valley Creek	High	High
Collins Creek-Klamath River	High	High
Tom Martin Creek-Klamath River	High	High
Tompkins Creek	High	High

Lower East Fork Elk Creek	Moderate	Moderate
Middle Creek	Moderate	Moderate
Music Creek	Moderate	Moderate
Rancheria Creek	Moderate	Moderate
Upper Grider Creek	Moderate	Moderate

Cumulative Effects for Alternatives 2, 3, 4, and 5

The direct and indirect effects for each of the alternative plus the cumulative effects will result in three watersheds going from low level of disturbance to a moderate level.

Comparison of Effects

The northern spotted owl is a threatened species under the Endangered Species Act and it isn't a Forest Service sensitive species, but in order to display the estimated effects of the project on this species for all alternatives, we presented it in this document. The Biological Assessment will present additional analysis for one alternative for the northern spotted owl and critical habitat to fulfill the ESA requirements.

Table 34. Summary of action alternatives effects on each sensitive species and northern spotted owl

Species	Determination			
	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Northern Spotted Owl	Likely to adversely affect northern spotted owl and critical habitat	Likely to adversely affect northern spotted owl and critical habitat	Likely to adversely affect northern spotted owl and critical habitat	Likely to adversely affect northern spotted owl and critical habitat
Species	Determination			
	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Bald eagle	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing	Will not affect a trend towards federal listing.
Northern goshawk	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing
Willow flycatcher	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing
Fisher	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing

Marten	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing
Wolverine	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing
Pallid bat	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing
Townsend’s big-eared bat	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing
Fringed myotis	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing
Siskiyou Mountains salamander	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing
Tehama chaparral snail	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing
Western bumble bee	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing	May impact individuals, but is not likely to result in a trend toward federal listing

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