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Environmental Impact Statement

King Fire Restoration Project

Volume 2 - Appendices

Eldorado National Forest
El Dorado and Placer Counties, California

View of Rubicon Canyon in the King Fire
Courtesy of Placer County Water Agency

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Appendix A
King Fire Ecological Analysis – Comparison to Natural Range of Variability

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Summary

The ecological condition of the mixed yellow pine conifer forests in the King Fire, Eldorado National Forest were evaluated using the Natural Range of Variability (NRV) concept. Using this approach, NRV was compared to current conditions determined from existing data. Compared to NRV, current mixed-conifer stands in the King Fire are generally characterized by: 1) a greater proportion of high severity fire, 2) a lower proportion of low and moderate fire, 3) larger patches of high severity fire, 4) departure from the pre-European fire return intervals, and 5) a greater amount of early-seral conditions. These conditions were than compared to the current proposed alternatives that treat the King Fire landscape at varying levels.

Cover Photo: This image was taken on October 1, 2014, from a reconnaissance flight to evaluate fuel treatment effectiveness in the King Fire. The image is looking 350° along the Rubicon drainage. This area burned on the 17th of September under extreme conditions, resulting in widespread complete consumption of conifers, hardwoods, and shrubs.

Introduction

King Fire Background

On Saturday, September 13, 2014, the King Fire began at approximately 3,000 feet elevation along Forebay Road near the town of Pollock Pines, CA, on the State District Protection Authority. The fire quickly spread onto the Eldorado National Forest (ENF) into steep, rugged terrain (slopes of 100% and greater) through the South Fork of the American River drainage before burning through the Rubicon drainage covering a total of 97,717 acres (39,544 hectares) (Figure 1). The fire burned on the Placerville, Pacific, and Georgetown Districts of the ENF, El Dorado and Placer Counties, a small portion of the American River District on the Tahoe National Forest (TNF), as well as private lands.

During the time period of September 13th-16th, the fire grew approximately 4,000 acres each day with a final growth on the 16th along three fronts totaling 8,000 acres. Weather conditions during this time were approximately in the 90th percentile. On September 17th-18th, fire behavior and growth were extreme with the burned area expanding over 50,000 acres. Early morning, Bald Mt. RAWS showed the RH significantly lower than previous days at 25 percent. At 0800, sustained winds were from the south at 20+ mph. This spread event was likely the product of several elements: drought-stressed fuels, very heavy fuel loadings, alignment with terrain features, exceptionally low relative humidity, and fairly unstable air mass. Peak fire behavior was estimated to be 100-150 chains per hour, 50-100 foot flame lengths, with crown fire runs, pyro-cumulus development, and a spotting distance of 2-3 miles. The time following the 18th of September, the King Fire grew to the final size of 97,717 acres, burning in varying conditions ranging from 2,400 acres of growth to 5,500 acres of growth.

Managing Within the Bounds of the Natural Range of Variability

Effective ecosystem management requires both explicit management goals and an understanding of the conditions and processes that maintain ecosystem integrity over time (Veblen and Donnegan 2005). Ecosystems are recognized as dynamic, exhibiting temporal and spatial variability at various scales providing new challenges and opportunities for land management. It is generally understood that efforts to achieve ecosystem sustainability and persistence are likely to be more successful if they maintain ecosystems within the bounds of natural variation rather than targeting a static equilibrium condition from some point in the past (Wiens 2012). It is important to understand that natural variation is not restricted to historical conditions, but rather is a characterization of the natural variation before major Euroamerican settlement of California in the middle of the 19th century and contemporary landscapes that have a more active fire regime. In the draft land management planning handbook, chapter 10 (FSH 1909.12.10.5), the Natural Range of Variation (NRV) is defined as:

> "Natural Range of Variation (NRV) [is the] spatial and temporal variation in ecosystem characteristics under historic disturbance regimes during a reference period. The reference period considered should be sufficiently long to include the full range of variation produced by dominant natural disturbance regimes, often several centuries, for such disturbances as fire and flooding and should also

> include short-term variation and cycles in climate. "Natural range of variation" is a term used synonymously with historic range of variation or range of natural variation. NRV is a tool for assessing ecological integrity, and does not necessarily constitute a management target or desired condition. NRV can help identify key structural, functional, compositional, and connectivity characteristics, for which plan components may be important for either maintenance or restoration of such ecological conditions."

Following the draft land management planning handbook (FSH 1909.12.10.15), the goal is to assess the ecological conditions and integrity of the King Fire area immediately post-fire and in the five alternatives proposed in the King Fire Restoration EIS using the following steps:

1. Describe the ecological conditions that would sustain ecosystem integrity relevant to the key characteristics, which will be evaluated using the NRV.
2. Describe the current ecological conditions relevant to the key ecosystem characteristics immediately post-fire.
3. Compare the present condition of the selected key ecosystem characteristics to those that would sustain ecosystem integrity to determine the status of each key ecosystem characteristic.
4. Evaluate the proposed alternatives in the King Fire Restoration EIS and provide a comparison between them and NRV.

Limitations of the NRV concept as a means to determine desired conditions do exist. The interpretation of NRV is limited by the data that is available to determine the NRV. This is recognized by acknowledging the level of confidence for each variable that is assessed. The impact climate has on reference conditions can also limit the relevance of historic data. This has been addressed by also drawing from current reference conditions (e.g., Yosemite National Park) to determine NRV as these are more representative of the current climate conditions. Finally, NRV does not incorporate information related to the social range of acceptability. The NRV information is most effective as a tool to identify key processes and their influence on structure, composition and function of ecosystems rather than a way to determine a fixed target over time (Safford 2013).

Methodology

Data Gathering Methods and Analysis

In order to collect information on the current ecological conditions within and surrounding the King Fire, data was assembled using existing datasets detailed within the "King Fire Vegetation Resiliency and Restoration Assessment" (Walsh et al. 2015). This document was assembled by forest specialists to help guide the decision-making process. These data detail information that could be used for landscape analysis; for example, existing vegetation composition and structure, the Wieslander vegetation composition and structure plots, and bioclimatic modelling. This information, when appropriate, was used in this analysis as a comparison to NRV.

Fire severity is defined as the direct effects of fire on a resource and is most often defined by the degree of soil heating or mortality of vegetation. Fire severity, in this case, is determined by utilizing pre- and post-burn images obtained by the Landsat Thematic Mapper (Bands 4 and 7), approximately one month and one year after the fire. Fire severity in this document is referencing the Rapid Assessment of Vegetation Condition after wildfire which is the immediate post-fire composite burn index map (RAVG 2013). Both the percent change in basal area and the composite burn index generated from RAVG were used to provide an index to compare the magnitude of fire effects across the King Fire. This methodology has been rigorously ground-truthed using the composite burn index field sampling protocol (Key and Benson 2006) and has been sufficiently peer reviewed for the Sierra Nevada (Miller et al. 2009).

In order to compare fire severity in the King Fire to the NRV, the seven-class percent change in basal area was classified as Unchanged (0% change), Low (0-25% Change), Moderate (25-90% Change), and High (>90%) severity for each of the alternatives and the Composite Burn Index (CBI) was classified into four classes as Unchanged (0%), Low (0-25%), Moderate (25-90%), and High (>90%) severity. Fire severity data (percent change in basal area) was considered high severity when the percent change in basal area exceeded 90 percent. All high severity patches with some conifer dominance (including mixed hardwood conifer) were considered to allow easy comparison to the NRV document for yellow and mixed conifer forest developed by Safford (2013).

To develop a comparison of current conditions with the NRV we first had to determine the NRV for mixed conifer forests in the Central Sierra Nevada and the greater Sierra Nevada. We carried out a comprehensive evaluation of the NRV information for Sierra Nevada mixed conifer forests. Our information sources included historical inventory data, contemporary reference information, modelling approaches, and other historical accounts to describe the NRV for key ecosystem characteristics, including the function, structure, and composition of mixed conifer forests (Table 1). Only ecosystem characteristics with sufficient NRV or current information were considered for analysis. The variables that were analyzed were also those that were directly affected by the fire and were important in planning efforts. We focused our characterization of the NRV for mixed conifer forests at the stand scale, but also included an evaluation at the landscape scale for select functional variables that operate at larger spatial scales (e.g., fire regime). We included data from peer reviewed sources as well as USDA Forest Service data (e.g., Region 5 FRID database) and technical reports. Although our focus was on the King Fire, we also used published sources from neighboring regions when we determined that such information was applicable, suitable, and complementary (e.g., information specific to the bioregion was limited). For more details on the methodological approach for selecting NRV information for this assessment, refer to (Romme et al. 2012; Safford 2013).

We compared NRV and current conditions in mixed conifer forests in the Sierra Nevada relying heavily on current conditions in the King Fire. We used a simple graphical contrast of the means and standard deviations of ecological characteristics when possible. These comparisons represented simple, generalized differences or similarities in ecological characteristics that required a certain degree of subjective interpretation. Summary statistics for NRV stands were primarily calculated from the mean values of data sources noted above; thus, values represent the overall mean and variance and not the full range of ecological variation among NRV data

sources. When possible, we also compared the NRV to proposed alternatives within the King Fire EIS. The major differences were the area treated, the types of treatments being applied and the amount of snag retention within each alternative. Alternatives 2, 4, and 5 were based on 10 percent of the Forest Resiliency Areas and Strategic Fuel Management Zones being retained as snag patches, and Alternative 3 was based on 20 percent of the same areas being retained.

The amount of early-seral coniferous forests in each class was determined by taking the initial conifer/mixed conifer hardwood dominated high severity patches and removing the treated areas that would transition them from one type of early-seral condition to another. A rough estimate of snag retention patches were determined by using the proposed design criteria for each Alternative.

Results and Discussion

Function

Background: Fire Regime

Ecological disturbances such as fire can be classified according to their characteristics (e.g., frequency, size, season, intensity, severity, pattern). A “fire regime” describes the manner in which fires tend to occur in a given ecosystem, in a generalized sense and averaged over many fires over a long period of time. Fire regimes necessarily simplify a very complex phenomenon, but they are a convenient and useful way to better understand and manage wildland fire (Sugihara et al. 2006). Under pre-settlement conditions, yellow pine and mixed conifer forests in the Sierra Nevada supported fire regimes characterized by frequent, low to moderate (or “mixed”) severity fires (Skinner and Taylor 2006; Van Wagtendonk and Fites-Kaufman 2006). In this section, we summarize information available on the different components of the fire regime for forests before Euroamerican settlement and compare this to current conditions in the King Fire and, when possible, to the respective alternatives.

Percent High Fire Severity in the Landscape: NRV and Comparison to Current

Mixed conifer forests were characterized by frequent mixed severity fires (Collins and Stephens 2010; Perry et al. 2011). Forests with mixed-severity fire regimes are characterized primarily by their mixed patches of vegetation of varied age, resulting from complex variations in both fire frequency and severity and species responses. This variability that is created in these landscapes supports an intermingling of early- and late-seral communities that contributes to resiliency (Halofsky et al. 2011)**.**

Historic accounts in yellow pine mixed conifer forests noted a dominance of low and moderate severity fire with only infrequent canopy mortality. Estimates of high mortality or stand replacement fire across the landscape in the late to early 1900s reported about five to eight percent in this condition (Leiberg 1902; Show and Kotok 1924). Both Safford (2013) and Meyer (2015) estimated the NRV for the Sierra Nevada drawing on a number of resources including reconstruction data, historic accounts, and contemporary forested landscapes. They estimated that the percent of burned area was 10-30 percent for unchanged, 31-58 percent for low severity,

15-35 percent for moderate severity, and 5-11 percent for high severity (Figure 2). These estimates are fairly robust in that they do draw on multiple data sources. These estimates also use a 90 percent threshold to indicate the transition from moderate to high severity fire.

Vegetative severity mapping of the King Fire showed that 46,000 acres (47%) of the landscape had high burn severity (>90% decrease in basal area) (Figure 1). Amounts of unchanged, low, and moderate severity were highly variable across the landscape (Figure 1). Differences were observed in fire severity patterns between September 17th and 18th (the one large growth day) and the remaining fire progression (Figure 3). Fire severity on September 17th and the 18th was highly influenced by prevailing weather conditions. Of the almost 55,000 acres burned during those two days, 71 percent of the area was initially categorized as high severity (Figure 3). Throughout the remaining days, fire severity was well distributed by severity type with only about a quarter of the area burning in high severity (Figure 3), an amount closely matching historic fire regime ratios (Safford 2013). Preliminary observations indicate that patterns of fire severity during this time period were influenced by vegetation type, fuel conditions, and topography.

The areas that burned under more benign weather in the King Fire (outside of the 17th) in the King Fire resulted in conditions aligned with NRV, low severity conditions (31-58% NRV, 38% King) and moderate severity conditions that (15-35 NRV, 20% King) (Table 2). Conversely, the area within the King Fire that burned on the 17th-18th of September burned well outside the range of variability with 71 percent of the landscape burning at high severity (Table 2). The entire fire was still heavily weighted toward high severity (47%) and was still below the NRV for unchanged and low severity fire (Table 2).

Percent High Fire Severity in the Landscape: Comparison of Alternatives

If no treatment was applied to the King Fire area, the proportion of fire severity would be similar to the discussion of current conditions in the fire. Unchanged, low, and moderate severity fire would be maintained at 53 percent and high severity would remain at 47 percent, irrespective of treatment on private lands (Table 3). The remaining alternatives would remove varying amounts of fire-killed canopy trees altering the post-fire severity proportions. These areas would likely transition faster to conifer dominated habitat which is an important value for a number of wildlife species dependent on mature forests. Despite these changes in the alternatives there will only be a modest reduction in the proportions of unchanged, low, moderate, and high severity across the landscape as compared to the existing conditions (Table 2).

High Severity Patch Size in the Landscape: NRV and Comparison to Current

In mixed conifer and yellow pine forests, high fire severity patches have increased in size, departing from the natural range of variability (Safford 2013). The NRV of high fire severity patches documented in the scientific literature for Sierra Nevada ponderosa pine and mixed conifer forests was strongly dominated by small patches less than 10 acres in size (Sudworth 1900; Show and Kotok 1924; Kilgore 1973; Skinner 1995; Weatherspoon and Skinner 1995; Skinner and Chang 1996; Minnich et al. 2000; Bradstock et al. 2010; Collins and Stephens 2010). Some portion of the landscape would have also been comprised of large patches, but these would have rarely exceeded 150 acres in size (Minnich et al. 2000; Collins and Stephens 2010).

The high severity (>90% mortality) conifer mixed patches covered 39,687 acres on both FS and non-FS lands (Figure 4). There were 1,446 patches within this area of which the median patch size was 0.67 acres and the mean patch size was 27 acres with a standard deviation of 505 acres (Table 4). High severity patch size mean within the King Fire is a close approximation of what Miller et al. (2012) found throughout recent fires in Sierra Nevada forests (30 acres in Miller et al. (2012) (Figure 4) . The minimum patch size (that could be detected) was 0.22 acre while the maximum patch size was 17,311 acres (Table 4). The total area burned was weighted heavily toward large patches; 88 percent of the total high severity area was in patches >150 acres, which only comprised 1.1 percent of the total number of patches (Table 4). The largest patch made up 44 percent of the total high severity patches (Table 4). Examples of the varying levels of severity and high severity patch sizes are shown in both Figure 5 and Figure 6.

High Severity Patch Sizes in Landscape: Comparison of Alternatives

The alternatives break up the continuity of the high severity patches in the northern portion of the fire (Figure 7). The number of patches increased across the fire in all alternatives as the treatments effectively break up the large patches into smaller patches (Table 5). Mean patch size ranged from 11 ± 81 acres to 23 ± 432 acres with a maximum range of 2,051-2,111 acres in the alternatives where treatments were proposed (Table 5). Alternative 1 still had a large maximum patch size of 13,661 acres which only reduced the high severity because of expected treatments on private lands leaving it remaining outside the range of variability (Table 5).

The remaining alternatives maintain a variable distribution of patches (Figure 7, Table 5). Patches under 10 acres covered 1,106-1,388 acres with Alternative 3 maintaining the highest amount of patches within NRV (Table 5). These patches are pretty well distributed across the project area in all alternatives (Figure 7). Patches that are 10-150 acres in size ranged from 2,856 acres to a maximum of 4,757 acres in Alternative 3 (Table 5). All alternatives maintained patches larger than 150 acres in size (considered to be outside of NRV) with Alternative 3 retaining the largest amounts and Alternative 4 retaining the smallest amounts over 150 acres in size (Table 5).

Fire Return Interval NRV and Departure (FRID)

Fire frequencies are often measured by fire return interval which is the number of years between fire events. Fire frequencies can be measured in a variety of methodologies. In order to get a robust estimate, we utilized Van de Water and Safford (2011) who conducted an exhaustive review of the published and unpublished literature to determine fire return intervals observed prior to significant Euroamerican settlement (i.e., the middle of the 19th century). The NRV for fire frequencies in the vegetation types found in the King Fire were drawn from estimates made for the Southern Cascades and Sierra Nevada. The mean FRIs ranged from 11-16 years in yellow pine and mixed conifer forests, and median FRIs ranged from 7-12 years. Mean minimum FRIs were around five years for both forest types, and mean maximum FRIs ranged from 40-80 years (Van de Water and Safford 2011, Safford 2013).

Fire return interval departure (FRID) is based upon fire history, vegetation types, and the pre-settlement fire regimes for those vegetation types as outlined above. The majority of the area,

with the exception of some small portion of the south part of the King Fire, had no fire history since 1908 (Figure 8). On the southeastern border of the King Fire a number of fires have occurred over the last 50 years (e.g., Ice House, Cleveland, Freds) but only a portion of the King Fire burned into those previous burn scars.

Safford and Van de Water (2014) compared pre-Euroamerican settlement FRIs to FRIs from the last century of fire records in California, using a set of FRID metrics. Figure 9 shows one of these metrics, mean PFRID in the King Fire. Similar to the King Fire history, it can be seen that most of the assessment area is highly positively departed, which means that FRIs are much longer than under pre-settlement conditions. Over 90 percent of the King Fire area is greater than +33 percent departed meaning they have current FRIs that are at least 1.5 times longer than under pre-settlement conditions; areas greater than +67 percent departed have current FRIs that are at least three times longer than in pre-settlement times. To put this into perspective, yellow pine and dry mixed conifer forests within the King Fire supported mean pre-settlement FRIs of about 11 years according to Van de Water and Safford (2011), which means that an average of 9.1 fires would occur over any given period of 100 years. Areas in Figure 9 that are greater than 33 percent departed from this pre-settlement FRI have experienced three fires or fewer over the last century.

Structure

Proportion of Early-Seral Habitat: NRV and Comparison to Current

Surprisingly little empirical and quantitative documentation of successional patterns in the yellow pine mixed conifer forests has been published. The natural range of variability in this context was derived from historic accounts, reconstructions, reference conditions and robust succession transition models.

Show and Kotok (1924) reported on the area of the National Forests in northern California that supported “brushfields” in the early 1920s, which were seral chaparral stands that had resulted from (often human-caused) fires in previously forested areas. Their estimate of 11.1 percent of the landscape on six National Forests in the assessment area is slightly higher than the current area of montane and mixed chaparral that occurs on productive forestland on the same National Forests (8.6%) (Safford 2013). A reconstruction study in Kings Canyon National Park (YPMC-giant sequoia forest) estimated that 19 percent of the study area was occupied by shrubfields in the late 1800s. This proportion had dropped to 11 percent in the late 1970s (Bonnicksen and Stone 1982).

The LANDFIRE BpS models predict that, under the pre-settlement fire regime, 15-20 percent of the average yellow pine-mixed conifer landscape would have been in early-seral stages (herbs, shrubs, seedlings/saplings), about 35 percent in areas dominated by trees between 10-53 cm dbh (5-21”), and 45-50 percent in areas dominated by trees >53 cm dbh (>21”) (Safford 2013). Although these values were generated from a model, the estimates are comparable with the historic accounts and reconstructions. They are also consistent with the mean high severity distribution for an assessment of NRV in the Southern Sierra (8.5 ± 4.4 acres) and an assessment of resource objective fires (7.0 ± 4.3 acres) (Meyer 2015).

Without treatment and assuming that the private ownership doesn't alter their lands, the King Fire would be maintaining approximately 50 percent of the landscape in early-seral conditions.

Early-Seral Habitat Comparison of Alternatives

The alternatives are proposing to retain different levels across a gradient of early-seral coniferous conditions. Multi-structure early-seral conifer forest will retain such features as fire killed trees, native shrub habitat and conifer and hardwood natural regeneration. Single-structure early-seral conifer forest will remove fire killed trees but will retain natural regeneration and native shrub components. Variable density early-seral conifer forest will focus on actively restoring conifer forest using artificial regeneration but will focus on a variable planting strategy which will help to maintain some percentage of shrub cover.

The amounts of multi-structure early-seral conifer forest maintained in the various alternatives ranged from 35-41 percent of the high severity conifer/mixed hardwood conifer patches. This is roughly half of what is retained in Alternative 1. Alternative 3 will retain the most multi-structure early-seral conifer forest after accounting for snag retention patches with 41 percent (Table 7). Single-structure early-seral conifer forest will help to provide potential habitat for naturally regenerating vegetation and ranged from 4-6 percent across alternatives. Alternative 4 had the highest retention because of the increase in treated area where natural regeneration could be relied on. The remaining early-seral conifer condition would reintroduce conifers in a variable structure that would mimic natural regeneration spatial patterns. This approach would likely retain some percentage of shrub regrowth even outside of the snag retention patches. The amount of area retained ranged from 26-31 percent across the alternatives, which would be outside NRV (8.6-11.1%).

To compare the alternatives to NRV the multi-structure early-seral conifer forest total (including snag retention patches) were calculated as a percent of the total fire area and assessed as one component of the successional stages. Alternative 1 retains the most early-seral but exceeded the calculated NRV (25% Existing, 15-20% NRV) (Table 8). The remaining four alternatives ranged from 14-17 percent and all fall closely within the NRV maintaining sufficient area in an early-seral condition. The addition of other early-seral conditions (single-structure, variable density) would likely maintain more early-seral habitats across a gradient across the King Fire area that would provide important features for a number of dependent species.

Climate Effects

The few models that have been run to estimate the effects of climate on conifer dominated forests suggest increased transition of forest to chaparral, but increased transition of chaparral to grassland as well, both trends being driven by increased fire activity (Lenihan et al. 2008) (Figure 11). Cole (2010) studied paleoecological data from earlier periods of rapid climate warming in the Pleistocene and suggested that current and projected future warming trends could be expected to greatly increase the amount of early-seral vegetation on the landscape. McKenzie et al. (2004) noted that, given current and projected trends in climate and fire, the long-term persistence of late seral forest in much of the western US was questionable. Based on projections as well as trends already in play in southern California, it seems likely that – especially at lower

elevations – some proportion of the YPMC forest belt will transition to shrubland and grassland over the next century (Safford 2013). It also seems likely that forest landscape structure will become gradually more coarse-grained as fire frequency and severity continue to increase and fire suppression efforts continue to lead to forest densification in the rest of the landscape. A high proportion of early-seral forests will occur on the landscape as future climate causes increased fire severity and frequency, therefore management efforts should focus on fostering mid- to late-seral stands.

Conclusions

The summary of NRV indicates that the King Fire resulted in conditions that exceeded the range (Table 9). Conditions after the fire showed altered proportions of fire severity, larger patches of high severity fire, and large areas that were reset to early-seral conditions (Table 9). Prior to the fire the departure from pre-European fire return intervals was high across the fire and will remain in this condition until prescribed fire is reintroduced (Table 9).

Alternatives attempt to shift these conditions closer to NRV through a number of varying proposed actions throughout the fire. All alternatives alter the proportion of high severity fire although all of them still exceed NRV. It is also important to note that all alternatives treat the low and moderate severity areas to different degrees. Recent research recommends that fire effects that result in moderate severity fire of similar proportion to low severity fire may be more effective for achieving ecological restoration objectives in fire excluded Sierra Nevada mixed conifer and yellow pine forests and low severity fire effects may be more beneficial to ecological objectives in active fire regimes (Meyer 2015). This emphasizes the importance of reducing treatment in the low and moderate severity areas or minimizing this treatment to maintain some proportion on the landscape that meets these criteria, especially since this area had been fire excluded (Figure 9). High severity patch sizes were well outside the range of variability. All alternatives change the distribution and continuity of these patches (Figure 7). The greater number of large (>150 acres) high severity patches on the landscape bring the landscape further from NRV, therefore Alternative 4 would get the closest to meeting NRV from a patch size perspective.

Prior to the fire, mixed conifer yellow pine forests were largely departed from the pre-European fire return interval. All alternatives propose to treat the landscape with prescribed fire in the next five years. The main objectives for these proposals are to break up continuity in early-seral habitat that will be largely dominated by shrubs and other herbaceous cover types. The main difference between the alternatives is the varying densities of trees that will be planted in the variable density areas. This post-treatment condition might affect the ability to prescribed burn in the future although little to no information is available on this type of treatment.

Maintaining multi-structure early-seral conditions is important across the King Fire area for: 1) supporting wildlife that require post-fire snags and shrubs, 2) breaking up the continuity of adjacent seral stages, and 3) allowing natural succession to proceed. All of the alternatives maintain multi-structure early-seral conditions that fall within NRV although Alternative 3 maintains the highest that still falls within the range of NRV.

Evaluating the NRV across the King Fire allows for the development and evaluation of treatments across this landscape. By understanding how the existing conditions differ from the NRV across the Sierra Nevada, we are better capable of shifting the landscape to a more resilient landscape.

Tables and Figures

Table 1. Literature and Data Sources Used to Estimate the Natural Range of Variation in Mixed Conifer Forests

Stand or Landscape Variable	Literature/Data Sources	Confidence
Proportion of fire severity classes	(Safford 2013, Meyer 2015)	Medium
High severity patch size	(Safford 2013)	Medium
Reference fire return intervals	(Van de Water and Safford 2011, Safford 2013)	High
Proportion of early-seral stage	(Safford 2013)	Medium

NRV reference information is based on a variety of sources which may include modeled estimates, stand reconstruction data, historic inventory data, and information from contemporary reference landscapes (e.g., landscapes with an active fire regime). “Confidence” refers to the level of certainty in the estimation of the NRV based on the number of studies evaluated, the depth and validity of information, and applicability to the landscape being compared to NRV.

Table 2. King Fire Severity (%) at Different Times During the Fire as Compared to NRV

Fire Severity	NRV	% Burned 17th of September	% Burned Outside of 17th of September	% Total Fire
Unchanged	10-30	**4**	21	12
Low	31-58	**12**	38	**25**
Moderate	15-35	**13**	20	16
High	5-11	**71**	**22**	**47**

*Bolded values are outside of NRV.

Table 3. Fire Severity Proportions in Each Severity Class by Alternative

Severity	NRV	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Unchanged	21 (10-30)	26	28	28	30	28
Low (0-25%)	43 (31-58)	14	16	15	15	16
Moderate (25-90%)	26 (15-35)	13	12	12	11	12
High (>90%)	9 (5-11)	47	44	44	43	44

Table 4. High Fire Severity Patch Metrics in the King Fire Alternatives

Alternative	Total High Severity Acres	Count Patches	Mean	Standard Deviation	Maximum	Largest Patch Area Percentage
King Fire[1]	39687	1446	27	505	17311	44
Alt 1	24233	1041	23	432	13661	56
Alt 2	12603	1123	11	81	2111	17
Alt 3	14562	1189	12	83	2111	14
Alt 4	12019	1090	11	80	2051	17
Alt 5	12603	1123	11	81	2111	17

[1] This includes all area that had some percentage of conifer dominance including areas that were conifer mixed hardwood and excludes the private inholdings.

Table 5. High Fire Severity Patch Sizes in the King Fire Alternatives[1]

Alternative	Patch Size				
	0 – 10 acres	10 -150 acres	150 – 500 acres	>500 acres	Total
King Fire	1555	3255	2679	32198	39687
Alt 1	1106	2856	3384	16887	24233
Alt 2	1253	3802	3179	4369	12603
Alt 3	1388	4757	3198	5219	14562
Alt 4	1240	3296	2924	4559	12019
Alt 5	1253	3802	3179	4369	12603

[1] This includes all area that had some percentage of conifer dominance including areas that were conifer mixed hardwood and excludes the private inholdings.

Table 6. Pre-European Fire Return Intervals (PFRI) from the Centuries Preceding Euroamerican Settlement for Yellow Pine and Mixed Conifer Forests in California
(Van de Water and Safford 2011)

Forest type	Mean	Median	Mean Min	Mean Max	Number of sources
Yellow pine	11	7	5	40	24
Dry mixed conifer	11	9	5	50	37
Moist mixed conifer	16	12	5	80	53

Table 7. Early-Seral Coniferous Conditions Classified by Level of Treatment (definitions provided in text) and Percentage of Conifer Dominated High Severity Fire in the King Fire

Seral Gradient	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Multi-structure early-seral conifer forest	61	32	37	30	32
Snag Retention Patches	-	3	4	5	3
Multi-structure early-seral conifer forest Total	61	35	41	35	35
Single-structure early-seral conifer forest	-	4	4	6	4
Variable density early-seral conifer forest	-	31	26	26	31
Total high severity (acres)	39,687	39,687	39,687	39,687	39,687

Table 8. Early-Seral Coniferous Conditions Classified by Multi-Structure Early-Seral Forest as a Percent of Total Fire Area

Early-seral Conditions	NRV	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Multi-structure early-seral forest total (acres)	-	24,238	13,839	16,300	13,739	13,839
Percent of Total Fire Area	15-20	25	14	17	14	14

Table 9. Summary of Current Ecological Conditions in the King Fire as Compared to NRV
(Conditions Are Noted As "Unknown" If Current Data Was Unavailable For Comparison)

Stand or Landscape Variable	Within NRV?	Direction of Departure	Alt(s) Bring Variable Closest to NRV	Figure/Table
Proportion of fire severity classes	No	Increased high severity fire	Alts 2, 5	Figure 2,3,4 Table 2,3
High severity patch size	No	Increase in large patches	Alt 4	Figure 4,5,6,7 Table 4,5
Reference fire return intervals	No	Longer FRI	Alt 3	Figure 8,9 Table 6
Proportion of early-seral stage	No	Increase in early-seral forests	Alts 2, 3, 5	Figure 10 Table 7,8

Figure 1. Preliminary Vegetation Severity Map (RAVG) Classified by the Composite Burn Index (CBI)

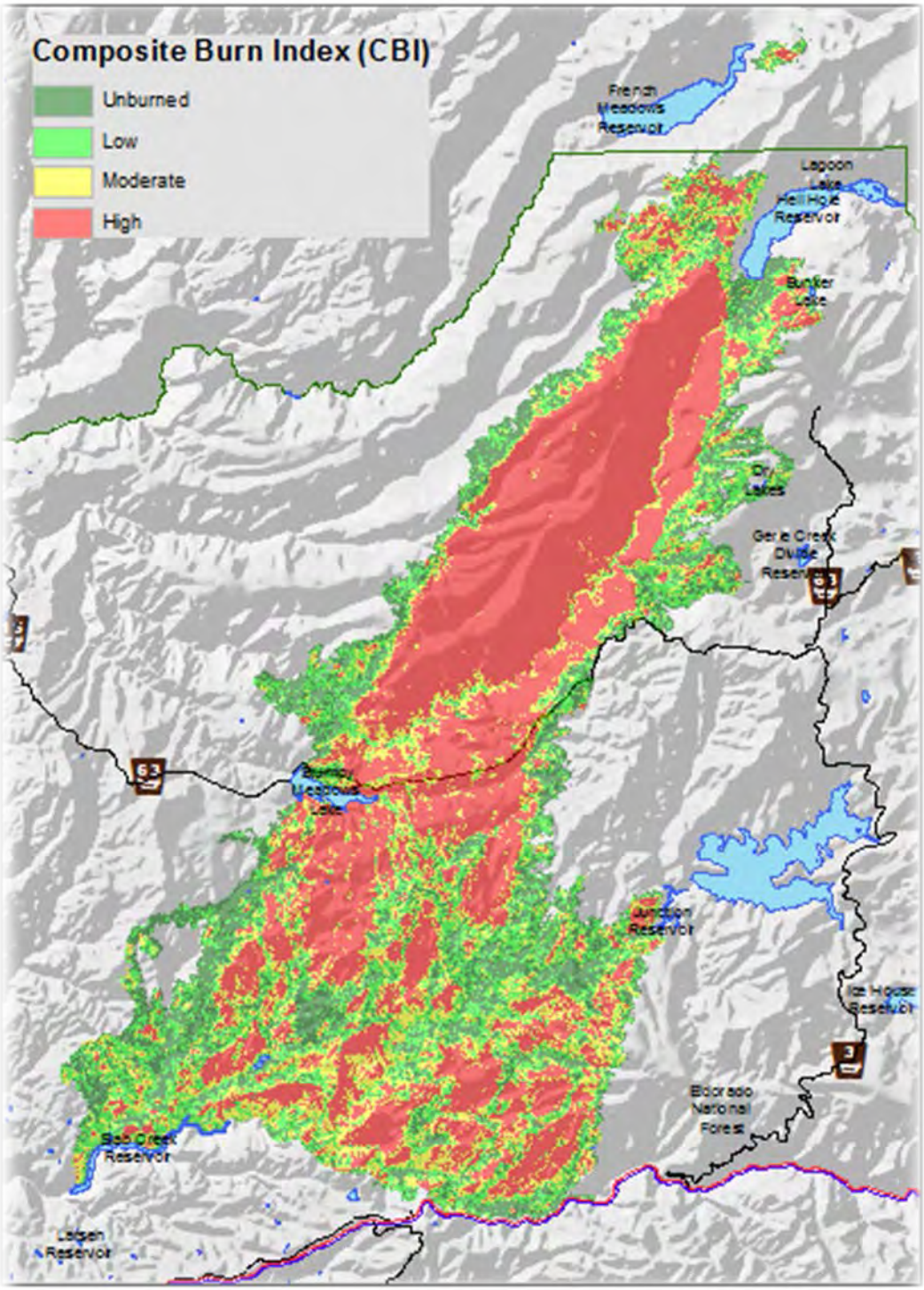


Figure 2. Mean (±SD) Fire Severity Proportions in Each Severity Class Based on NRV and Resource Objective Wildfires in the National Forests of the Southern Sierra Nevada
(Meyers 2014)

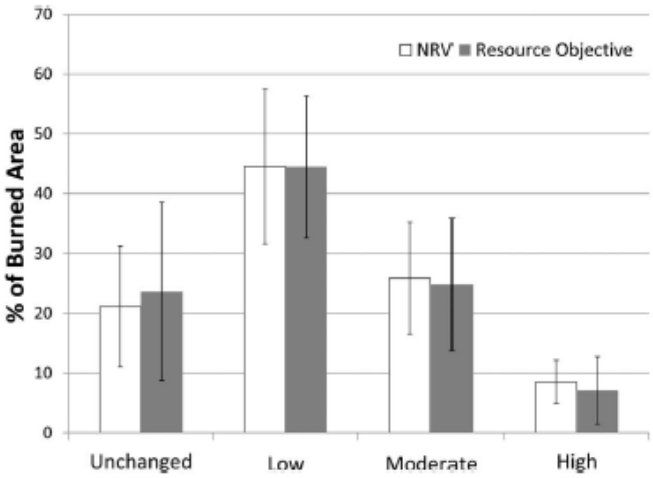


Figure 3. Vegetation fire severity was dependent on the dominant weather during the respective burn period.

Fire severity throughout the entire fire progression (a), fire severity on September 17 (b), and fire severity on all days excluding September 17 (c).

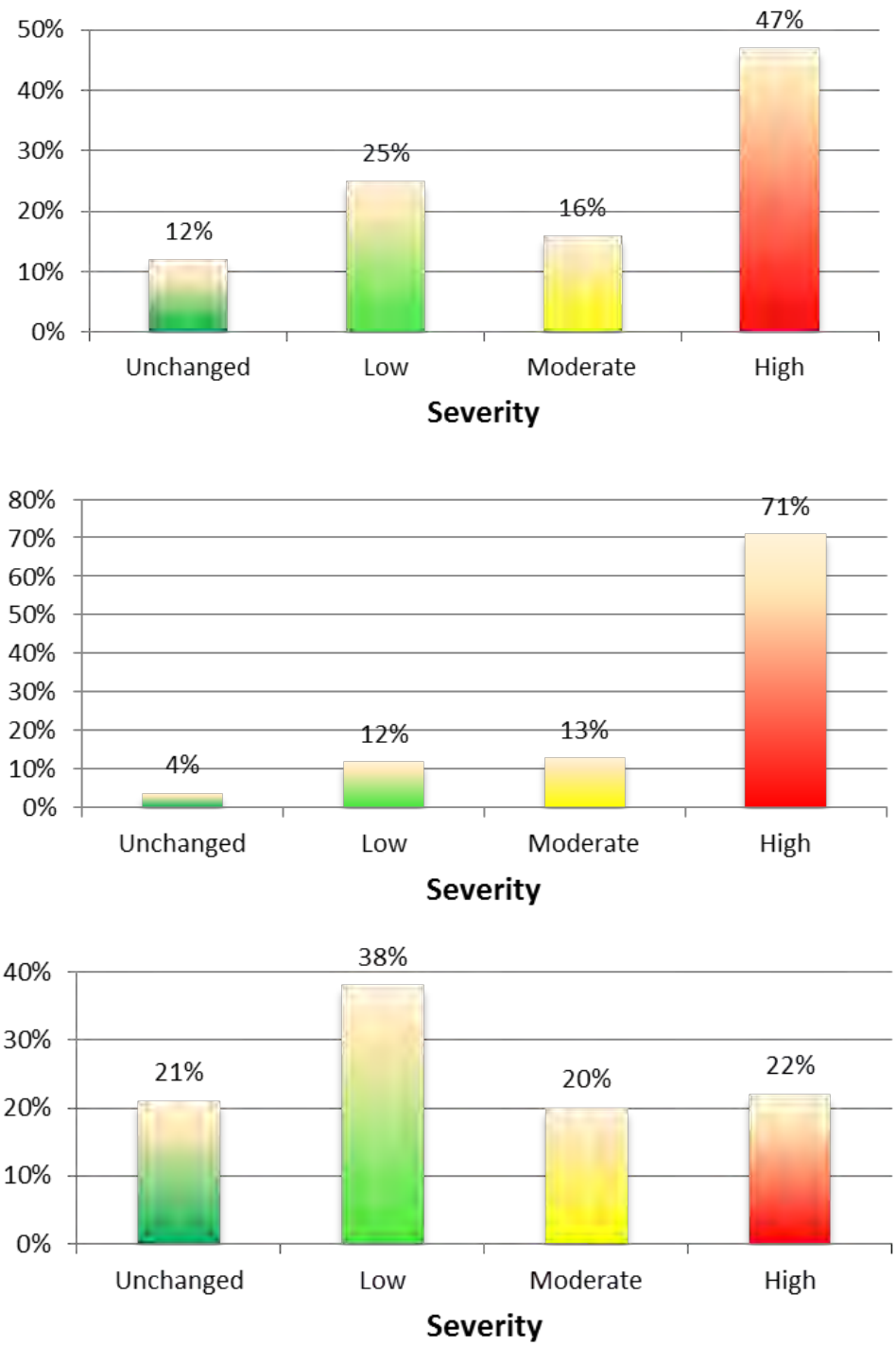


Figure 4. Histogram of High Severity Conifer Mixed Patches on the King Fire
Acres are on a logarithmic scale.

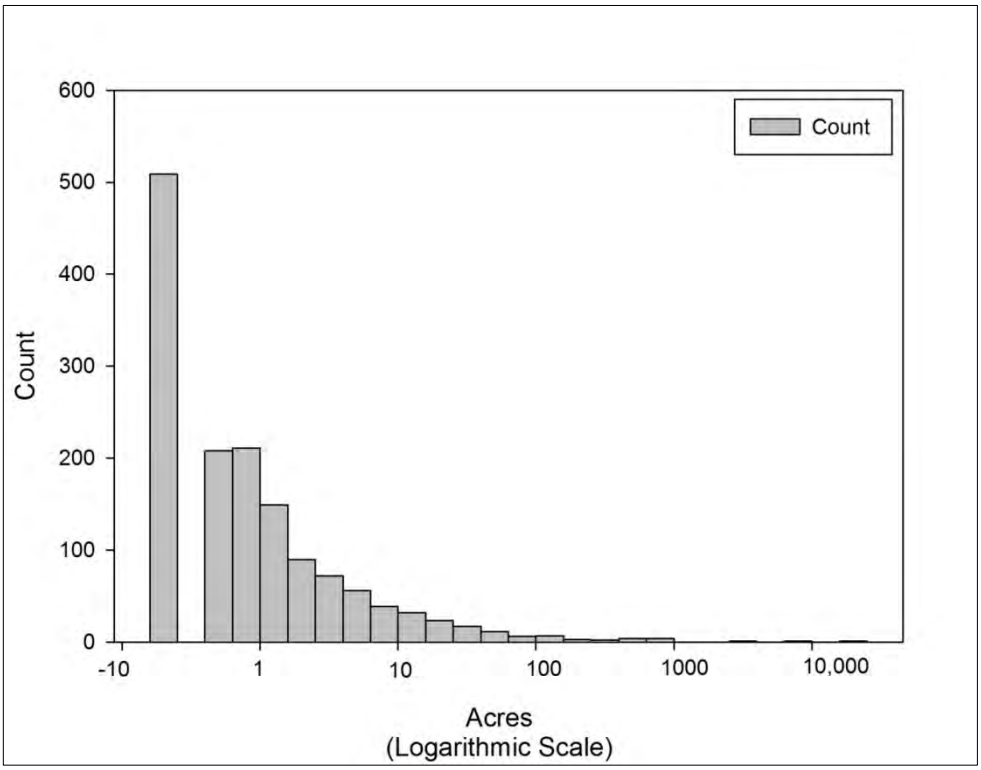


Figure 5. Examples of mixed and high severity in the King Fire.
The left panel burned on 9/16/2014 in moderate weather conditions. This resulted in patches of unburned or surface fire that had only isolated mortality in the canopy and patches of high severity with >90 percent mortality. The right panel burned on 9/17/2014 in extreme weather conditions leading to large patches of high severity with >90 percent mortality.

Figure 6. Canopy View of a High Fire Severity Patch (Upper) and a Moderate Severity Patch Within the King Fire

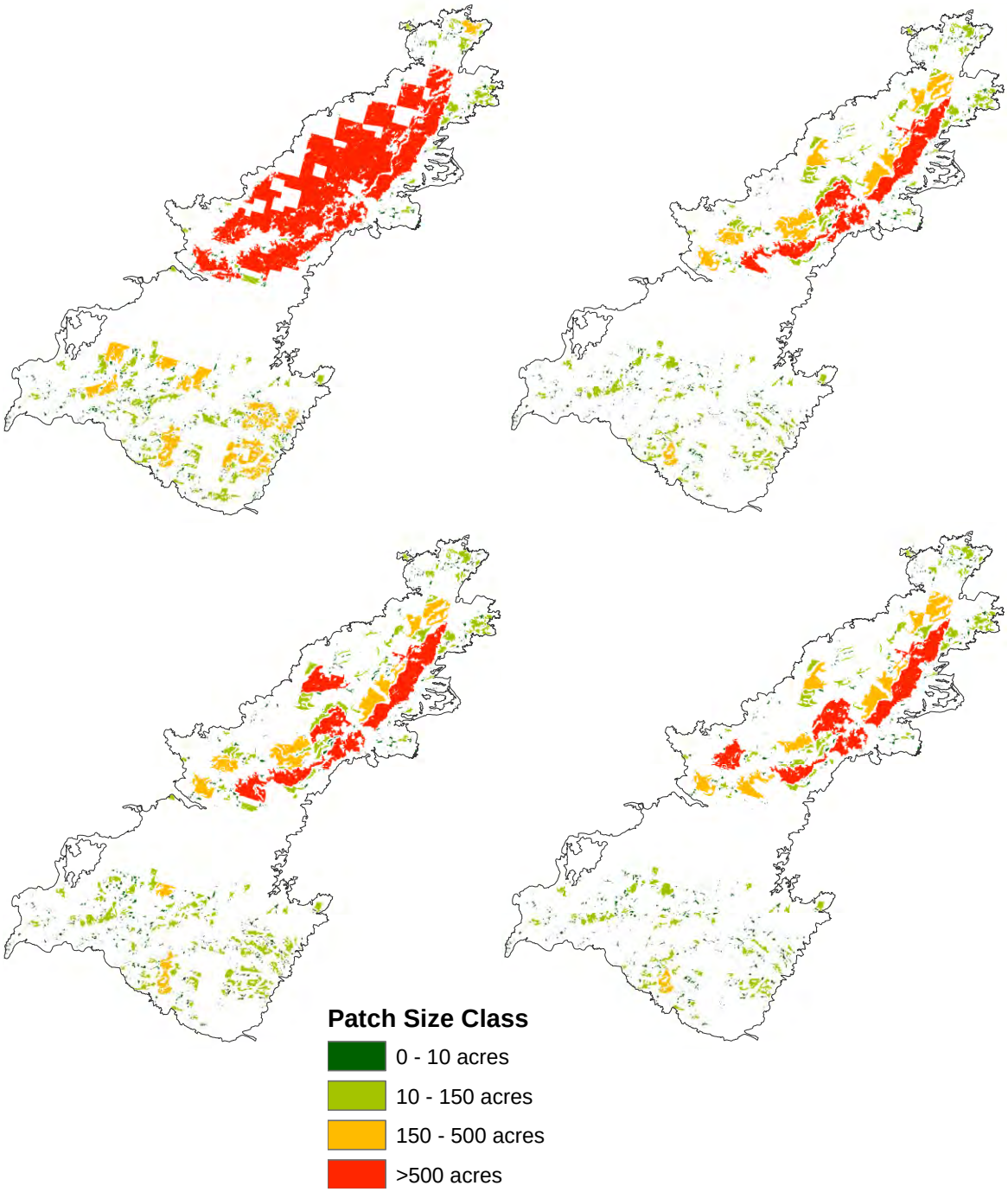


Figure 7. Conifer dominated high severity patches in four size classes (0-10, 10-150, 150-500, and >500 acres) in the four alternatives. Alternative 1 – 4 clockwise starting in upper left corner. Alternative 5 is similar to Alternative 2.

Figure 8. Fire History by Decade Within the King Fire Perimeter

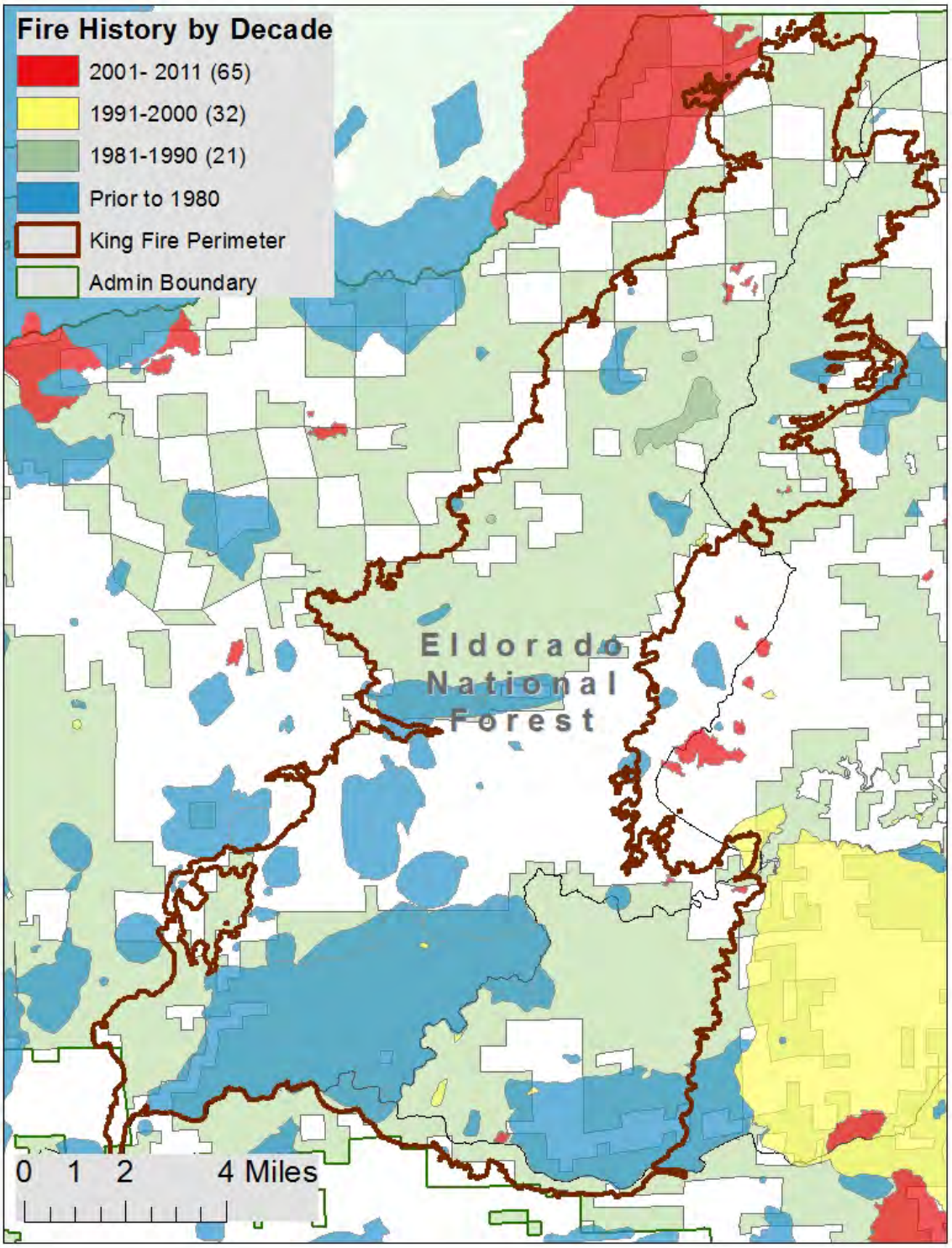


Figure 9. Mean Percent Fire Return Interval Departure in the King Fire

Warm colors are experiencing more fire than under pre-Euroamerican condition, cool colors are experiencing less fire.

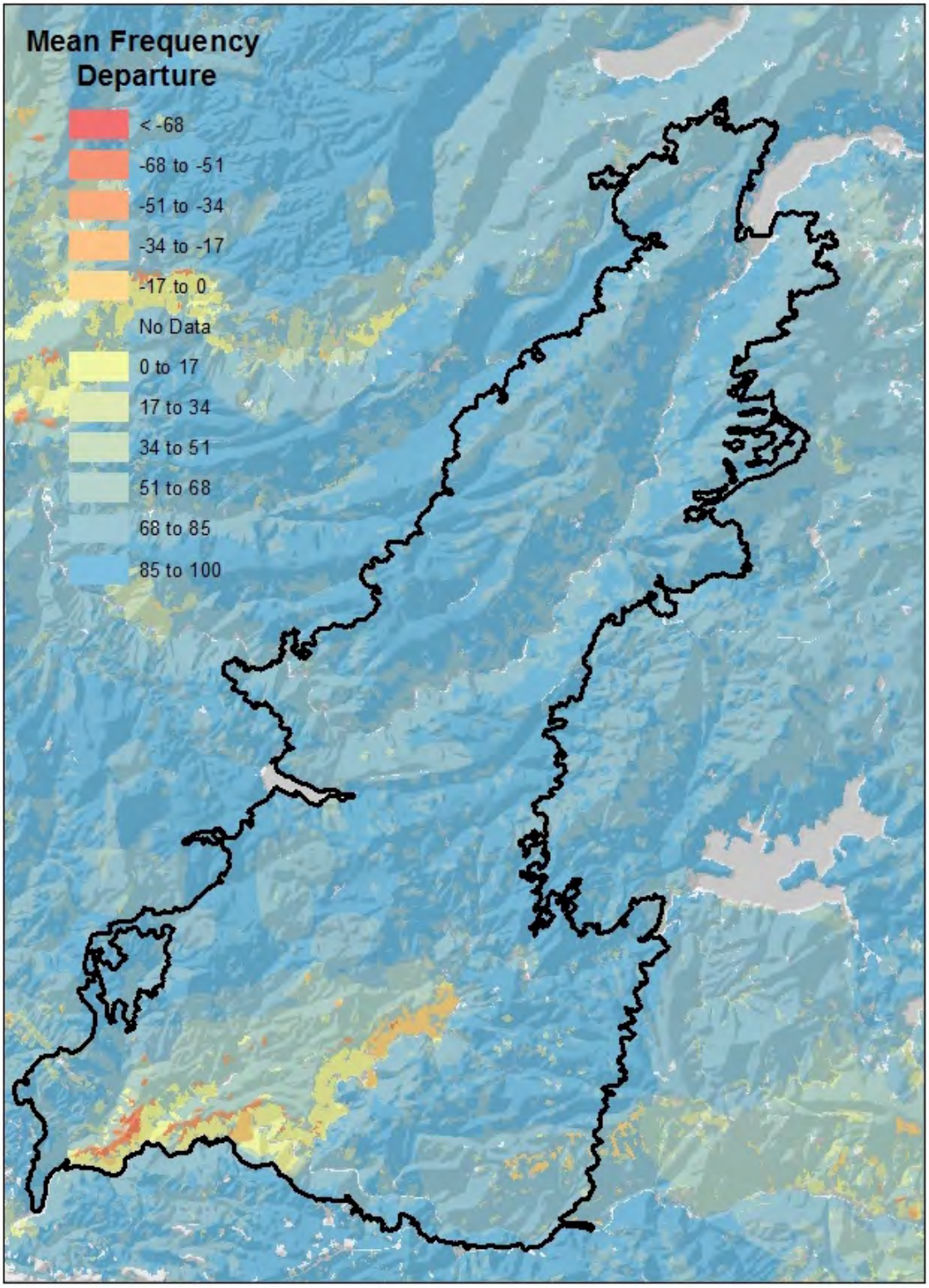


Figure 10. Average Landscape Conditions for Pre-Settlement YPMC Forests as Predicted by LANDFIRE BpS State and Transition Models for LANDFIRE Modeling Region 6

Only applicable on landscapes greater than about 5,000 hectares in area. See text for definitions of successional classes.

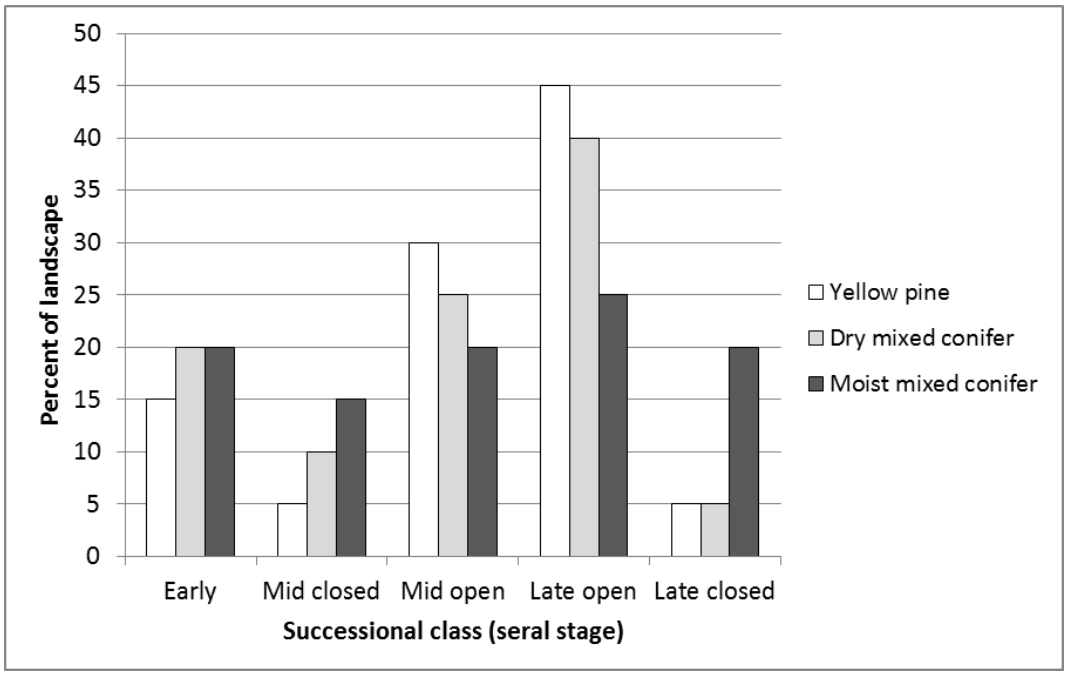
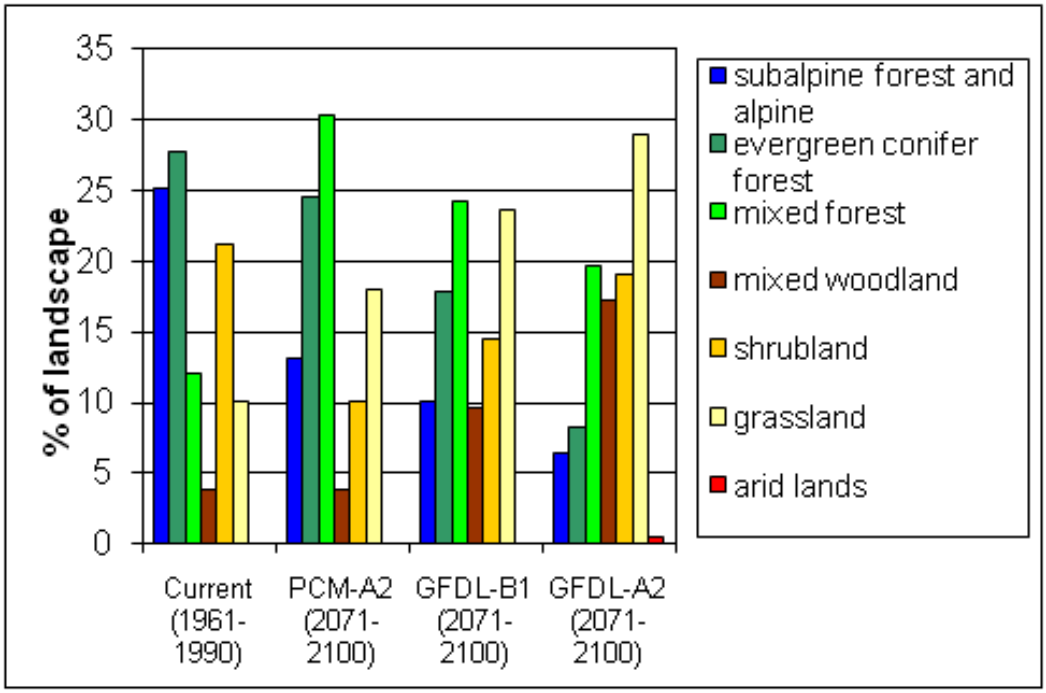


Figure 11. Lenihan et al. (2008) Modeling Results for the Sierra Nevada, Current vs. Future Projections Of Vegetation Extent

These Ecological Sections include most of the Sierra Nevada west slope. The GFDL-B1 scenario = moderately drier than today, with a moderate temperature increase (<5.5° F); PCM-A2 = similar ppt. to today, with <5.5° temp. increase; GFDL-A2 = much drier than today and much warmer (>7.2° higher). All scenarios project significant loss of subalpine and alpine vegetation. Most scenarios project lower cover of shrubland (including west side chaparral and east side sagebrush), due principally to increasing frequencies and extent of fire. Large increases in the hardwood component of forests are projected in all scenarios. Large increases in cover of grassland. Figure from Safford et al. (2012b).



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APPENDIX B

KING FIRE VEGETATION RESILIENCE AND RESTORATION ASSESSMENT

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BACKGROUND

On Saturday, September 13, 2014, the King Fire began at approximately 3,000 feet elevation along Forebay Road near the town of Pollock Pines, California, on the State District Protection Authority. The fire quickly spread onto the Eldorado National Forest (ENF) into steep, rugged terrain (slopes of 100% and greater) through the South Fork of the American River drainage before burning through the Rubicon drainage covering a total of 97,717 acres (39,544 hectares) (Figure 1). The fire burned on the Placerville, Pacific, and Georgetown Districts of the ENF, El Dorado and Placer Counties, a small portion of the American River District on the Tahoe National Forest (TNF), as well as private lands. The King Fire perimeter totaled 97,717 acres, of which 63,536 acres is National Forest System lands managed by the Eldorado National Forest.

This report is designed to inform planning of recovery, reforestation, and restoration activities within the area. It is also intended to provide background on the long-term planning for restoring a resilient landscape. This document is meant to be used in concert with the "Fire Management Strategy within the King Fire" (Ebert et al. 2015) developed for the area, management objectives for other forest resources, and public participation to develop proposed actions and alternatives for National Environmental Policy Act (NEPA) decisions. This document is not meant to be a NEPA Proposed Action, but rather to inform future proposed actions.

The following analysis and information is based on historic conditions, conditions immediately prior to the fire, post-fire conditions, the current and past fire regime, environmental conditions, and long-term climate expectations for the area.

GIS DATA USED FOR ANALYSIS:

- S_R05_ENF.ExistingVegetation
- S_USA.BasicOwnership
- Ca3878212060420140913_20140903_20141005_ravg_data
- S_R05_ENF.Strata
- LMU (Landscape Management Unit) tool data for unsimplified slopes
- Wieslander Vegetation Composition Mapping
- Wieslander Vegetation Plot Level Data in the King Fire area
- Bioclimatic Envelope Modelling
- Kernal Density Probability Estimates of Future Seedfall

FOREST VEGETATION DESCRIPTION

HISTORIC VEGETATION

Historical ecology interprets previous landscape conditions such as vegetation composition and structure. It is of interest to land managers as it can provide a means to identify changes in forest conditions and ecosystem processes to help inform desired future conditions.

A wide range of data can be used to determine historical conditions from past efforts at vegetation mapping, reconstruction, and historical distributions of trees from the General Land Office surveys (GLO). To determine historical conditions in this project, the Wieslander Vegetation Type Map (VTM) project was utilized. This program was conducted from 1928 to 1940 by the US Forest Service in an effort to record the State of California vegetation (Wieslander 1935). Three efforts accomplished these goals: 1) photo documentation (Figure 1), 2) extensive tree/shrub plots, and 3) vegetation cover type mapping (Wieslander 1935).

FIGURE 1. *PINUS PONDEROSA, PINUS LAMBERTIANA* VIRGIN TIMBER NEAR MICHIGAN, CALIFORNIA, LOGGING CAMP. REPRODUCTION MOSTLY *ABIES CONCOLOR*., T 12 N R 13 E SEC 22, ELEVATION 4800 QUAD NAME: PLACERVILLE. QUAD NUMBER: 56

TABLE 1. WIESLANDER VEGETATION CLASSIFICATION BY WILDLIFE HABITAT RELATIONSHIP (WHR) LIFEFORM CLASS FOR ONLY THE AREA ON THE ELDORADO NATIONAL FOREST BURNED IN THE KING FIRE[1]

Vegetation Class	Acres
Conifer Forest / Woodland	47,681
Hardwood Forest / Woodland	11,505
Herbaceous	44
Barren	50
Shrub	3,309
Grand Total	**62,589**

[1]The difference in total acres reflects the coverage dissimilarities between the Wieslander maps and existing vegetation maps.

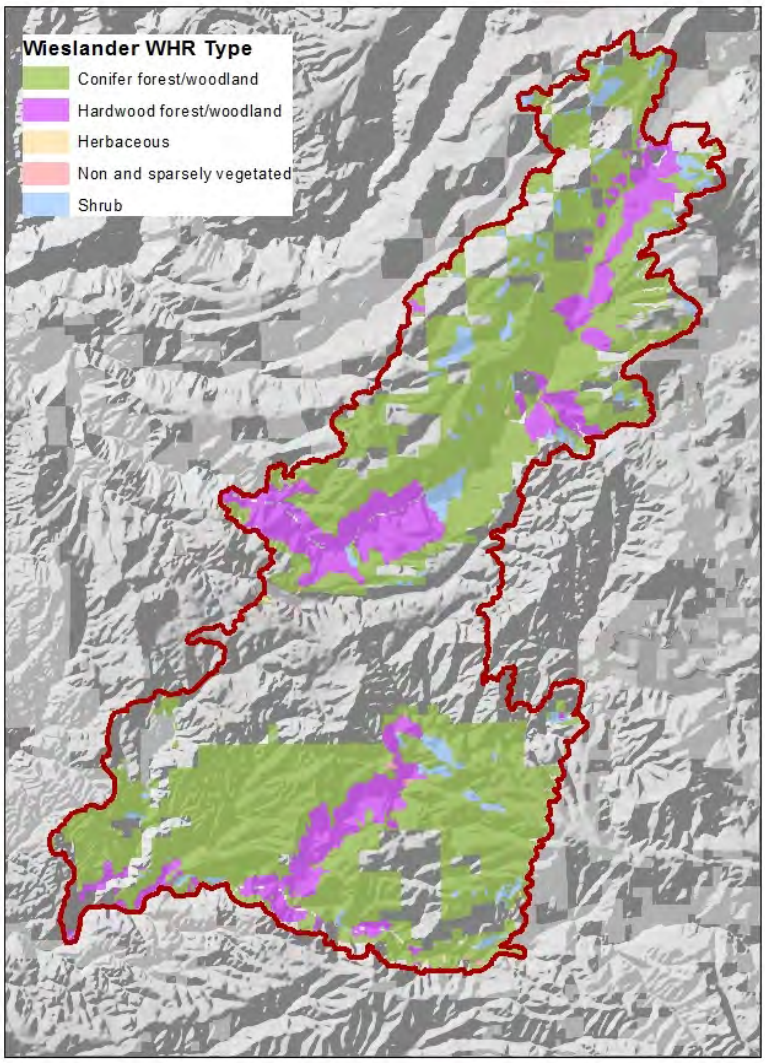

FIGURE 2. THE EXTENT OF WILDLIFE HABITAT RELATIONSHIP VEGETATION COVER TYPES IN THE KING FIRE TAKEN FROM THE WIESLANDER COMPOSITION MAPS.

PRE-FIRE VEGETATION

While the current (pre-fire) vegetation is important to assessing site capability and can inform future management objectives, it is important to recognize that the condition of the forest prior to the fire is not necessarily indicative of a desired condition. Forests in this area pre-European were historically subject to frequent, low to moderate intensity fires that resulted in open, fire-resistant stands of trees (Van Wagtendonk and Fites-Kaufman 2006). Multiple decades of fire exclusion, grazing by domestic livestock, mining, and historic logging practices, including selective logging of large pines and lack of follow-up slash treatment, have contributed to altered fire regimes, heavy fuel loadings, and changed vegetation composition and structure (McKelvey et al. 1996; Knapp et al. 2013; Safford 2013).

To various degrees the forest prior to the fire had been changed from one dominated by large, old, widely spaced trees to one with dense, fairly even-aged stands. Past timber harvest, infilling of trees into gaps that were historically created or maintained by fire and species composition shifts had resulted in a homogenization of the landscape (Knapp et al 2013). Compared to historic conditions stands had fewer old fire-resistant trees, such as ponderosa pine, more stands with multiple canopy layers and high stem densities, and a more densely forested landscape with continuous and high fuel levels (Collins et al. 2011). Consequently the landscape had been identified by the Eldorado National Forest to be more susceptible to stand-replacement wildfire, because it was highly departed from its pre-European fire return interval (Estes and Gross 2015).

Prior to the fire, the main land allocation based on the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) for the areas burned was Home Range Core Area (HRCA) for California spotted owl. The areas within the fire had been recognized as not meeting desired conditions for fire and fuels objectives, forest health, or stand resilience, and several fuels reduction and forest health projects had been planned to move vegetation in strategic areas from current conditions to a more resilient condition, while continuing to provide and advance habitat objectives associated with the HRCA land allocation. These projects included the Big Grizzly Forest Health and Fuels Reduction Project, the Blacksmith Ecological Restoration Project, the 2-Chaix Fuels Reduction and Forest Health Project, the Misfire Fuels Reduction Project, the Hartless Fuels Reduction Project, and the Hey Joe Fuels Reduction Project within recent years. While Misfire, Hey Joe, and Hartless had been recently completed, the other projects were still in the initial stages of implementation.

Other than some hazard removal and immediate burn area emergency response work, the majority of vegetation treatments including salvage and reforestation are likely to focus on the areas that were identified as conifer or mixed hardwood/conifer forest prior to the fire.

TABLE 2. VEGETATION CLASSIFICATION BY WILDLIFE HABITAT RELATIONSHIP LIFEFORM CLASS FOR ELDORADO NATIONAL FOREST BURNED IN THE KING FIRE

Vegetation Class	Acres
Conifer Forest / Woodland	44,106
Hardwood Forest / Woodland	11,619
Herbaceous	508
Mixed Conifer and Hardwood Forest/ Woodland	3,594
Non and Sparsely Vegetated	939
Shrub	2,649
Grand Total	**63,415**

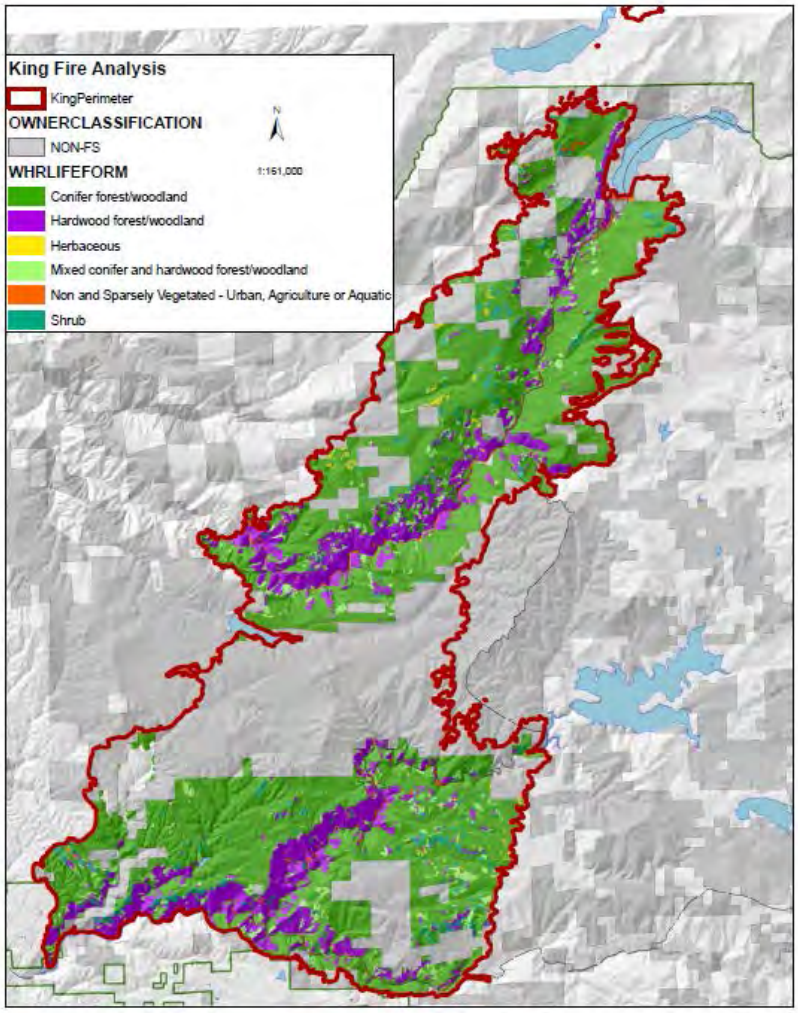

FIGURE 3. WHR LIFEFORM CLASSIFICATIONS FOR AREAS BURNINED WITHIN THE KING FIRE

TABLE 3. WHR VEGETATION TYPES FOR CONIFER AND MIXED CONIFER AND HARDWOOD FOREST/WOODLAND TYPES WITHIN THE AREAS OF THE ELDORADO NATIONAL FOREST BURNED BY THE KING FIRE.

Vegetation Class and Type	Acres
Conifer	**44,105**
Closed Cone Pine	116
Jeffrey Pine	1,048
Ponderosa Pine	6,594
Red Fir	59
Sierra Mixed Conifer	35,745
White Fir	543
Mixed Hardwood-Conifer	**3,594**
Blue Oak Foothill Pine	12
Mixed Hardwood-Conifer	3,582

For conifer forests, the most common CWHR size class was 4 and 5. This indicates that most conifer stands within the fire perimeter were considered to be comprised of mid-seral to late-seral stage forests prior to the fire. Impacts from the fire to the conifer forest are especially important because conifer forest types provide some of the most beneficial uses to a variety of wildlife as well as a source of resource and economic value to local communities. Conifer forest may take decades to develop from young, seral stands to mature forests characterized by larger diameters and higher canopy cover.

HISTORIC VEGETATION COMPARISON TO PRE-FIRE VEGETATION

Thorne et al. (2008) compared Forest Service vegetation maps from the 1930s (VTM project; Wieslander 1935) with modern Forest Service vegetation maps in the Central Sierra Nevada. They found that the extent of montane hardwood, Douglas fir, and annual grassland had increased while low elevation hardwoods, montane chaparral, and upper elevation conifers had declined over the 60-year period. Thorne et al. (2008) noted that some of the chaparral areas had potentially transitioned to hardwood stands, but others were large patches of chaparral from earlier timber harvest and fires that had transitioned to conifer forest after the institution of fire suppression. Additionally, Thorne et al. (2008) reported a shift of the Sierra Nevada pine belt upslope as a result of intensive forest management and a changing climate. Most of this area was replaced with lower elevation shrubs and tree species (Weeks et al. 1934).

The Wieslander Vegetation Composition Mapping, when compared with the pre-fire vegetation map, identified the following trends specific to the King Fire (Table 4):

- No significant changes in areas dominated by conifers or hardwoods were noted within the King fire perimeter;
- Areas dominated by chaparral had decreased in the King fire perimeter since the Wieslander surveys were completed;
- Some areas dominated by hardwood and chaparral at the time of the Wieslander surveys had been replaced with an increased density of conifers; and

- Non and sparsely vegetated areas and herbaceous areas have increased since the time of the Wieslander surveys

TABLE 4. COMPARISON OF WIESLANDER TO PRE-FIRE VEGETATION CLASSIFICATION BY WILDLIFE HABITAT RELATIONSHIP LIFEFORM CLASS FOR ELDORADO NATIONAL FOREST BURNED IN THE KING FIRE. PERCENT AREA WITHIN THE KING FIRE THAT THE WHR TYPE COVERS.

Vegetation Class	Wieslander Vegetation %	Pre-Fire Vegetation %	Relative Change %
Conifer Forest / Woodland	76.18	75.22	-1.26
Hardwood Forest / Woodland	18.38	18.32	-0.33
Herbaceous	0.07	0.80	+91.25
Non and Sparsely Vegetated	0.08	1.48	+94.59
Shrub	5.29	4.18	-20.98

CHANGES IN VEGETATION RESULTING FROM THE FIRE

Areas in the King Fire that burned at lower severities are likely to maintain their structure and function into the future, while areas that burned at high severity will shift to an early-seral state. This shift is expected to be most pronounced in the areas that were identified as conifer forest and mixed hardwood/conifer forest prior to the fire.

TABLE 5. AREAS OF CONIFER AND MIXED CONIFER HARDWOOD FOREST WHERE BURNING WAS IDENTIFIED TO HAVE RESULTED IN BASAL AREA LOSS GREATER THAN 50 PERCENT ON NATIONAL FOREST SYSTEM LANDS WITHIN THE ELDORADO NATIONAL FOREST.

Vegetation Form and Class	>90% Mortality	75% to <90% Mortality	50% to <75% Mortality	Grand Total
Conifer Forest	**19,485**	**1,161**	**1,760**	**22,407**
Closed Cone Pine	40	6	11	57
Jeffrey Pine	593	10	17	621
Ponderosa Pine	2,433	208	335	2,977
Red Fir	20	3	3	26
Sierra Mixed Conifer	16,211	917	1,371	18,500
White Fir	187	17	22	227
Mixed Hardwood-Conifer	**1,914**	**126**	**175**	**2,216**
Blue Oak / Foothill Pine	0	0	2	3
Mixed Hardwood- Conifer	1,914	126	1,73	2,213

High severity patch sizes within the yellow pine mixed conifer forests were historically small (less than 10 acres) in size with some large patches greater than 150 acres in size covering about half of the total fire area (Sudworth 1900; Show and Kotok 1924). In low and middle elevation forests, high severity patch size has risen, with a dominance of small, scattered patches in pre-settlement and reference estimates, versus more contiguous, coarser-grained patchiness in modern fire-suppressed forests (Safford 2013). Recently, high severity patches >1,000 acres have become a regular occurrence with some areas doubling the area of high severity fire (Miller et al. 2012). In current reference sites such as the Sierra San Pedro Mártir and Yosemite National Park, high severity patches were <40 acres and <10 acres in size, respectively (Minnich et al. 2000; Collins and Stephens 2010). Additionally, Collins and Stephens (2010) analyzed fire severity patchiness in a watershed of Yosemite National Park and found that 48 percent of the total high severity area was in patches >150 acres, which only comprised about five percent of the total number of patches.

High severity conifer patches in the King Fire matched patch sizes seen in other fires that have occurred recently in the Sierra Nevada (Miller et al. 2012). The high severity patches covered 35,313 acres on both FS and non-FS lands. There were 279 patches within this area of which the area weighted mean was 6,358 acres (Figure 4). The landscape was more heavily weighted to the large patches which composed about 34 percent of the high severity area (Figure 5).

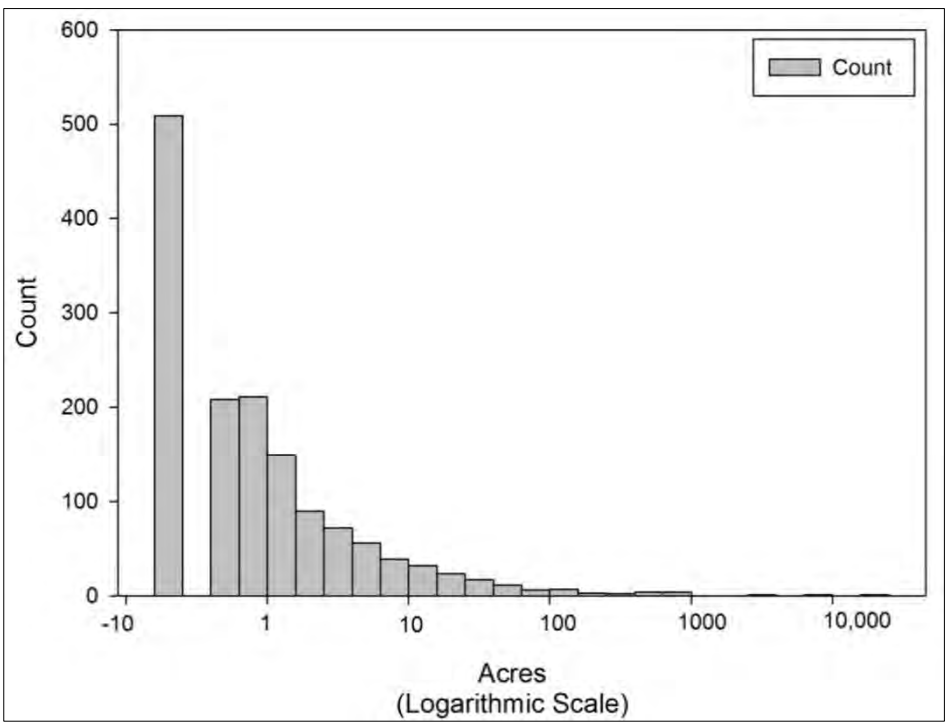

FIGURE 4. HISTOGRAM OF HIGH SEVERITY CONIFER MIXED PATCHES ON THE KING FIRE. ACRES ARE ON A LOGARITHMIC SCALE.

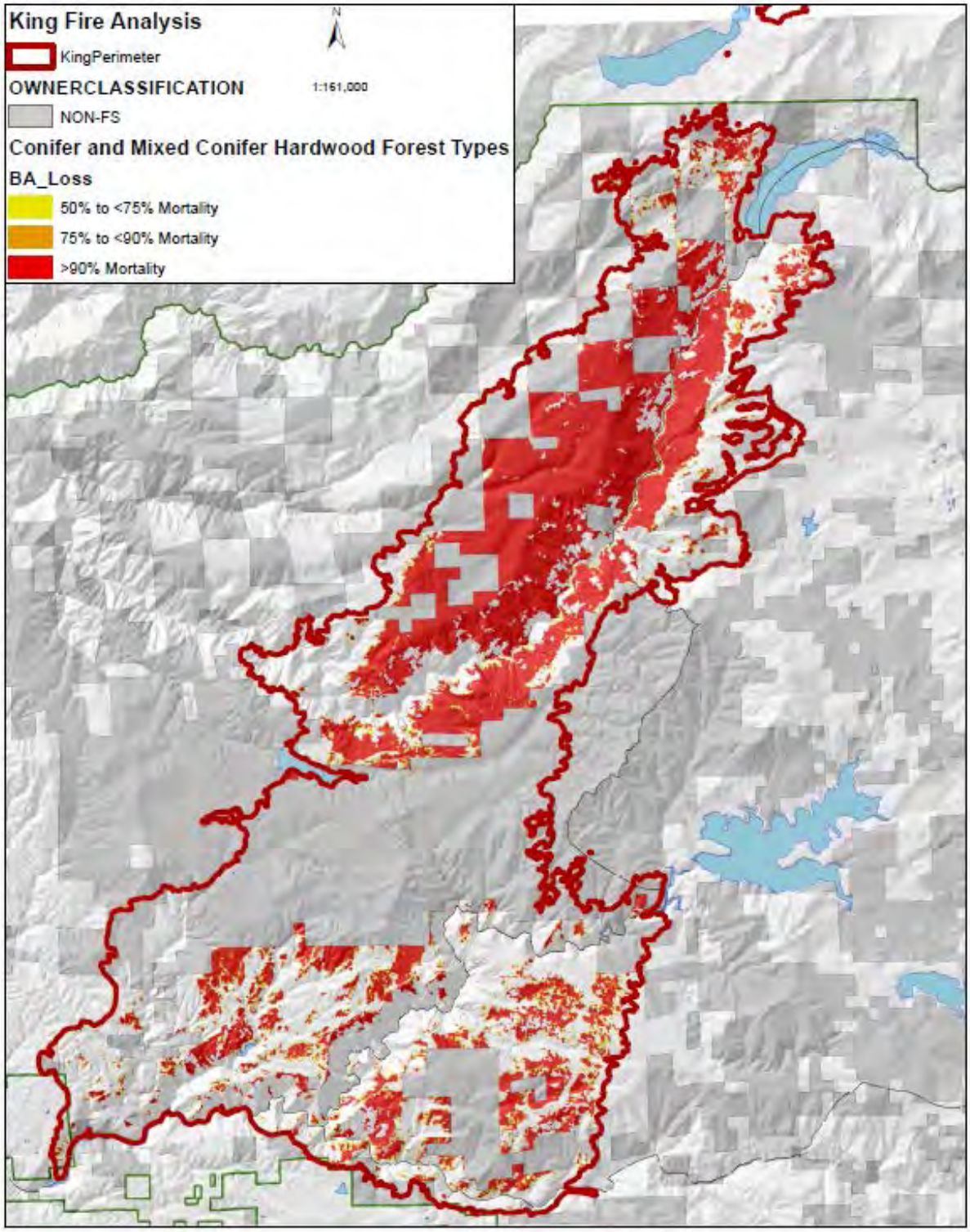

FIGURE 5. CONIFER AND MIXED CONIFER HARDWOOD FOREST TYPES WHERE BURN SEVERITY WAS IDENTIFIED AS RESULTING IN GREATER THAN 50% BASAL AREA LOSS

FUTURE CLIMATE INFORMATION

Few models have been completed that estimate the effects of climate on conifer dominated forests. Most suggest increased transition of forest to chaparral and increased transition of chaparral to grassland driven by increased fire activity (Lenihan et al. 2008). Paleoecological data from earlier warm periods (Pleistocene) that act as a corollary to our current predicted shifts in climate suggest an increase in early-seral vegetation and a decrease in the long-term persistence of late-seral forest in much of the western United States (McKenzie 2004, Cole 2010). Based on projections and current trends in southern California, it seems likely that some proportion of the yellow pine/mixed conifer forest belt will transition to shrubland and grassland over the next century (Safford 2013).

To quantify exposure to change, the degree to which a particular location, in a particular time window, was marginal, or outside, the current bioclimatic envelope was determined. This was then assessed for climatic projections for three time periods: 2010-2040, 2041-2060; 2061-2080. Each particular location was then characterized as at risk of change by assessing whether it falls outside the 99th percentile of the climate space for current representatives of that type. If a location is projected to be highly exposed by the end of the century, we mean that the climate of that location, using the 'best case' or 'worst case' model, is projected to fall outside the climatic attributes that describe 99 percent of current locations for that forest type. This assessment provides information on what areas may not persist as a particular vegetation type, but does not predict community shifts or the capacity of the current vegetation to adapt to climatic changes (Schwartz, personal communication).

Future projections (2041-2060) of climate exposure in the King Fire area based on the PCM model (warmer and similar precipitation) show that some areas may be moderately sensitive to future climate change. Levels of climate exposure indicate bioclimatic areas that are projected to be: 1) inside the 66th percentile (Dark Green), 2) in the marginal 67-90th percentile (Light Green), 3) in the highly marginal 90-99th percentile (Yellow/Orange), or 4) outside the extreme 99th percentile (Red) for the current bioclimatic distribution. Areas in green are suggestive of climate refugia.

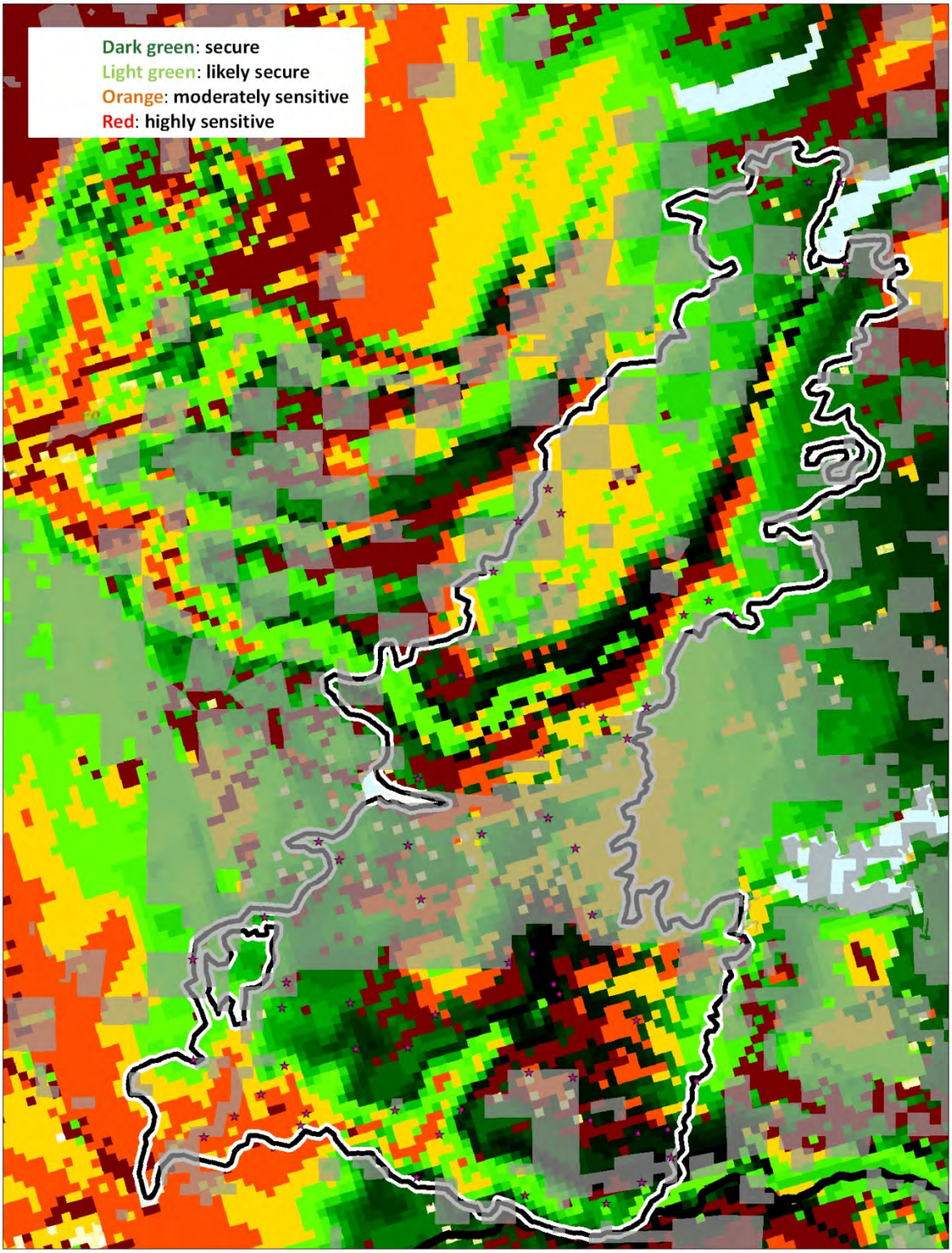

Figure 6. Bioclimatic envelope modelling in the King Fire Area (Schwartz, personal communication)

LANDSCAPE POSITION

Topography (e.g., elevation, slope, aspect, complexity) influences biophysical gradients such as solar radiation and topographic moisture (Holden et al. 2009). Studies have also found relationships between topography and fire severity (Weatherspoon and Skinner 1995; Collins et al. 2007; Thompson and Spies 2009). Fire regimes dominated by stand-replacing (high severity) fire regimes are not heavily influenced by microtopological variations (Turner et al. 1999). Likewise, forests that are significantly departed from historical fire return intervals may burn more homogeneously due to increased fuel loading (Miller et al. 2008). This is particularly true under extreme weather conditions that tend to negate the influence of topography on the landscape (Bradstock et al. 2010).

Topography is also a strong driver of environmental conditions. The density and structure of stands are dependent on landscape position, aspect, site quality, and available soil moisture. Likewise, these environmental conditions predict forest species composition, but are also an indication of past fire severity (Underwood et al. 2010; Lyderson and North 2012).

These differences in topography are evident across the King Fire landscape with varying aspect, elevation, and slope percent which all lead to variable environmental conditions (Figure 7). Twenty-one percent of the King Fire is found on ridges (Table 6, Figure 7). Approximately 23 percent of the King Fire was found in canyons and lower slopes. The remaining area was found at midslopes of which 36 percent were located on southwest facing aspects. Slope percent ranged from 15-47%. All topographic locations had a similar wetness index although differences are likely more fine scaled than what was predicted.

TABLE 6: ASPECT, ELEVATION, SLOPE PERCENT, AND WETNESS INDEX BY TOPOGRAPHIC LOCATION IN THE KING FIRE.

Topographic Location	Percent of Landscape	Aspect	Elevation	Slope Percent	Wetness Index
Ridges	21	199 ± 100	4487 ± 932	35 ± 22	9 ± 1
Canyon/Lower Slope	23	200 ± 100	3877 ± 958	43 ± 25	10 ± 2
Mid slope NE < 30%	11	158 ± 134	4716 ± 551	17 ± 9	10 ± 2
Mid slope NE > 30%	9	175 ± 134	4448 ± 823	47 ± 17	9 ± 1
Mid slope SW < 30%	25	223 ± 60	4654 ± 646	15 ± 9	10 ± 2
Mid slope SW > 30%	11	202± 58	4349 ± 922	45 ± 15	9 ± 1

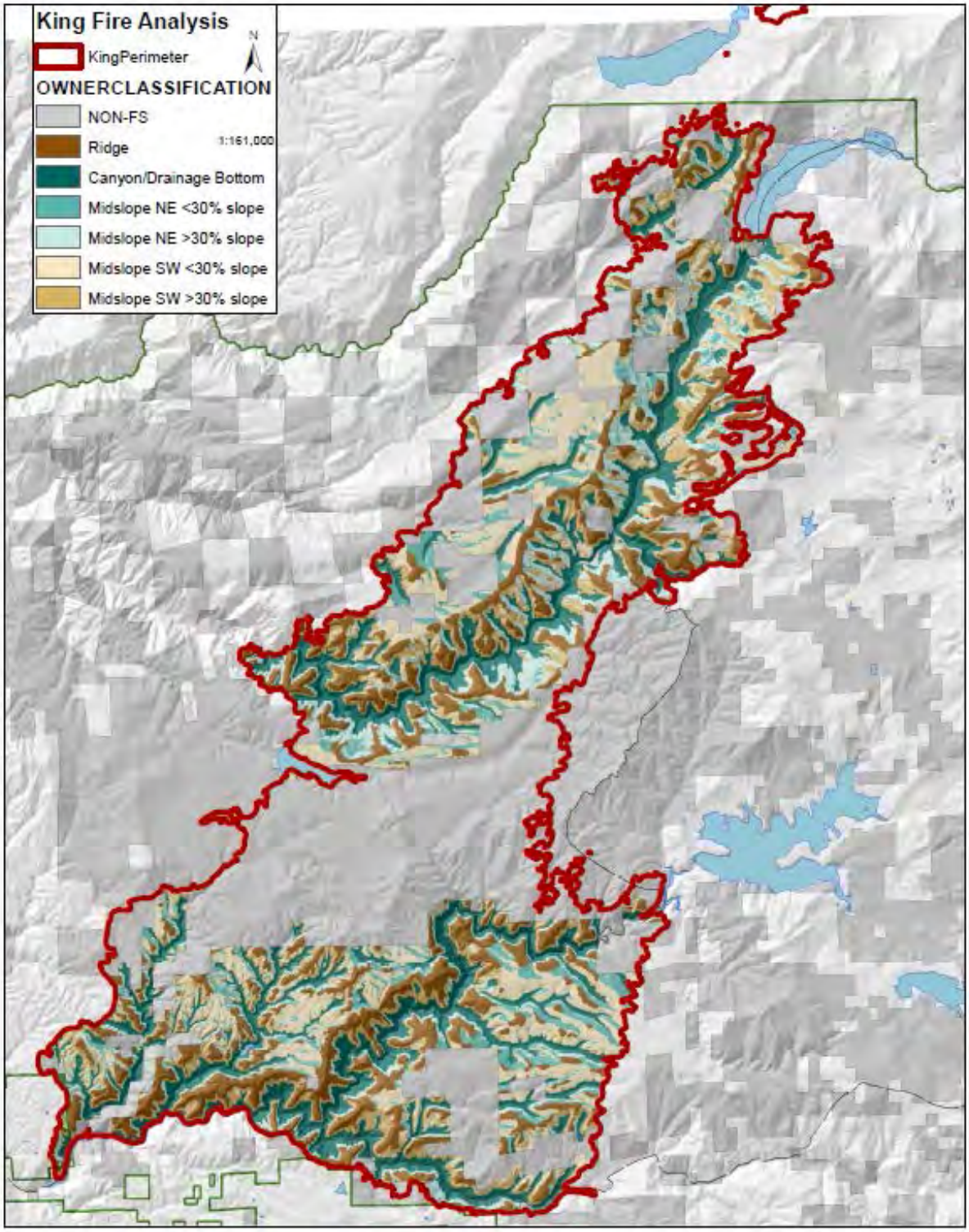

FIGURE 7. LANDSCAPE POSTION ANALYSIS USING UNSIMPLIFIED SLOPES FOR THE KING FIRE AREA

FOREST REGENERATION

The ability of forests to regenerate after stand-replacing fire is highly dependent on seed sources. Larger patches can create openings larger than available seed from neighboring surviving conifers can reach (Bonnet et al. 2005). Areas that have experienced high severity fire have been shown to have dramatically lower regeneration rates for conifers and especially for pines compared to areas burned at moderate or low severity (Crotteau et al. 2012). Crotteau et al. (2013) did not sample distance to seed source, but concluded that because seed trees were rare in their observation of high severity fire patches, this was a factor in their finding that fire severity impacted regeneration.

Although post-fire seedling establishment is driven by a series of factors (e.g., available moisture, soil insolation, rodent herbivory, damping-off fungi), the foremost requirement for most natural conifer regeneration is a seed source (Bonnet et al. 2005). It is likely that conifer regeneration densities in the low and moderate severity burns would be highest due to nearby remnant mature, seed-bearing trees. In addition to seed production, the remnant overstory in low and moderate severity burns produce high shade, a factor which may limit shrub competition, further permitting high densities of seedlings to establish. Uncharacteristically large high severity patches, on the other hand, have such poor overstory survival that distance to seed source becomes a limiting factor (Bonnet et al. 2005). High-severity burns may be less likely to naturally reforest if the scale is sufficient to preclude seed-tree adjacency (Bohlman and Safford 2014). While some studies have not been able to associate tree regeneration patterns in stand replacing patches with patch characteristics (size, perimeter-to-area ratio, or distance to edge) seedling regeneration and especially pine regeneration are reduced in patches of high severity fire (Collins and Roller 2013). Based on the current scientific information and previous experience it is expected and this analysis assumes that while some regeneration is likely to occur in portions of the areas of the King Fire where the fire resulted in substantial loss of vegetative cover due to moderate to high soil burn severity, regeneration of conifers and especially of pine in the area classified as high severity will be limited compared to other areas of the fire that burned at lower intensity.

Some areas may induce a reversion from forests back to shrubfields that were present under a more naturally occurring fire regime that existed under previous climatic condition (Nagel and Taylor 2005; Beaty and Taylor 2008). Severe fire may also induce type conversions that may not have occurred had the forest been in a more resilient condition (Long et al. 2014). The percent of grasses, forbs, and shrubs that establish within the King Fire is expected to increase in the areas that burned at higher fire severity. In areas where shrub development is rapid, shade tolerant trees and shrubs will likely be the dominant vegetation types into the future. Tall shrubs tend to create a competitive environment that favors shade tolerant conifer species, such as white fir and incense cedar. These species can persist in a shrub understory until eventually overtopping the shrubs. Shade intolerant species, such as ponderosa pine, and partially shade intolerant species, such as sugar pine, are also capable of seeding into sites at the stand initiation phase but competition with shrubs can create an unfavorable environment (Gray et al. 2005; Plamboeck et al. 2008). Outside of some strategic fuel treatments, post-fire salvage and restoration activities on National Forest System lands are most likely to occur within the high severity fire conifer and mixed conifer/hardwood forest with slopes less than 35 percent. This area totals approximately 16,000 acres. These areas present the best opportunity to restore forest conditions within the fire area and provide a seed source for future natural regeneration.

In order to determine approximate distance from nearest seed source, current literature states that dispersal is generally thought to occur within one to two tree heights, or ~200 feet and long-range distance dispersal has been documented at over 1,300 feet. To take a conservative approach, a 328-feet

kernel density estimate was completed. Kernels were generated using unburned, low and moderate severity as proxies for seed sources, which were weighted as 3, 2, 1 to reflect theoretically more seed sources in the unburned, low, moderate categories.

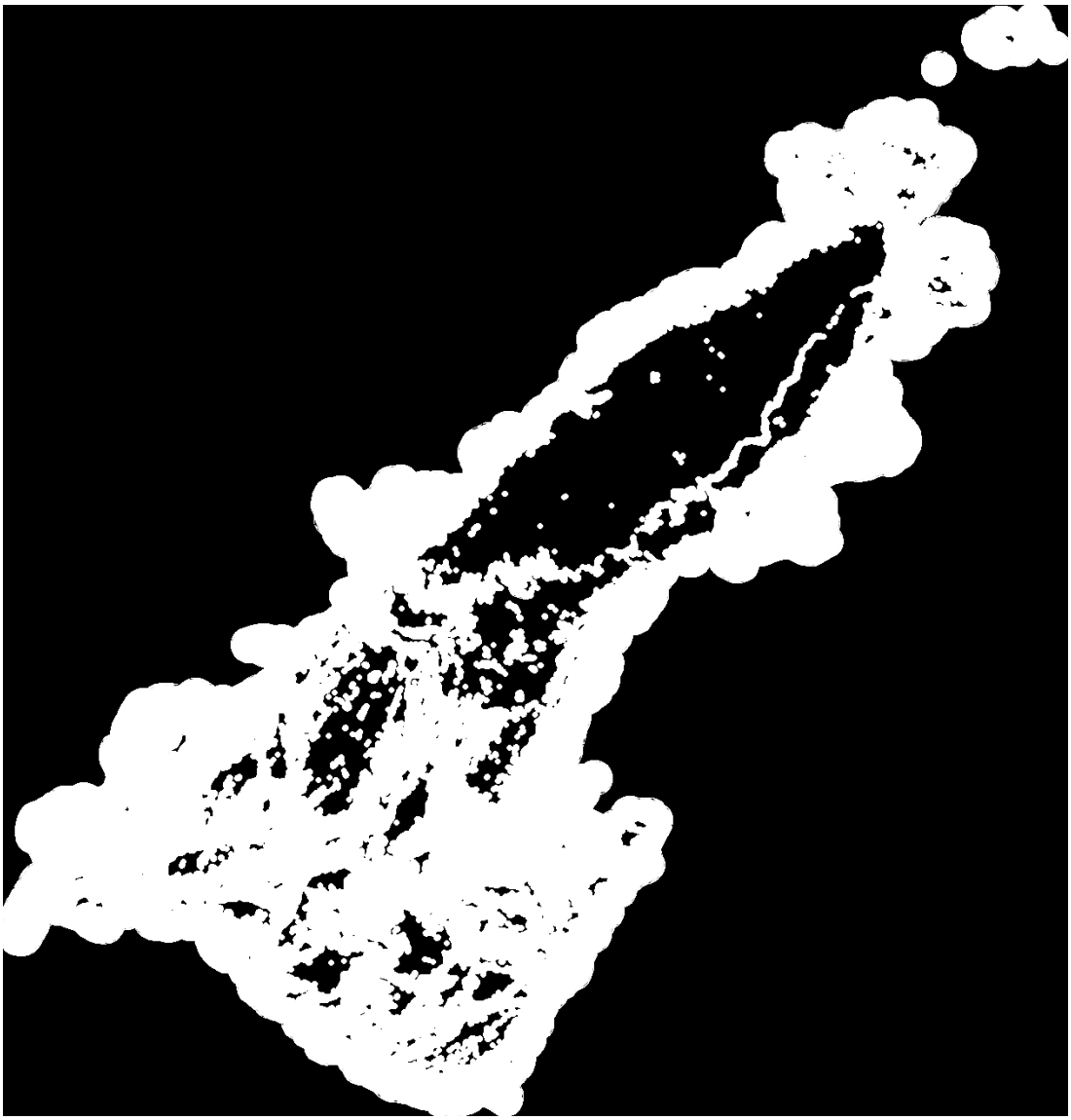

FIGURE 8. HIGHEST PROBABLE AREAS OF NATURAL REGENERATION AREAS (WHITE) IN THE KING FIRE AREA

SITE CLASS

Site class is important in both the forest structure an area can be estimated to support and in the timeline for developing forest structure. Higher sites are typically capable of producing and sustaining more complex forest structure than lower site conditions. While site class is defined in terms of timber volume growth, stand development is also an important factor for other forest resources.

REGION 5 (R5) SITE CLASS

R5 Site Class is based on Dunning's Site Classification. Site classes are represented by height and age as shown below. These are based on ponderosa pine, Jeffrey pine, sugar pine, Douglas fir, red fir, and white fir. Age is in years. Total height is in feet of average dominant and predominant trees with tree age of at least 50 years.

Site Classes for Region 5 were adapted from Dunning's site index curves for height at 300 years. Bulletin #28 Forest Research Notes 12/1/42 rerun 11/58. (http://www.fs.usda.gov/detailfull/r5/landmanagement/gis/?cid=fsbdev3_048098&width=full)

TABLE 7. HEIGHT BY AGE AND SITE CLASS CODE

Age	Site 0	Site 1	Site 2	Site 3	Site 4	Site 5
40	95	81	66	49	43	35
50	106	90	75	56	49	39
60	115	98	82	63	53	43
70	122	105	88	68	58	45
80	129	111	93	73	61	48
90	135	116	98	77	64	50
100	140	121	102	81	67	54
110	145	125	106	84	70	54
120	149	129	109	87	72	55
130	153	133	112	90	74	57
140	157	136	115	93	76	58
150	160	139	118	95	78	60
160	163	142	120	98	80	61
170	166	144	123	100	81	62
180	169	147	125	102	83	63
190	172	149	127	104	84	64
200	175	152	129	106	86	65
220	179	156	133	109	88	67
240	184	160	136	112	90	68
260	188	163	139	115	93	70
280	191	166	142	117	95	71
300	195	169	145	120	96	73
320	198	172	147	122	98	74

Age	Site 0	Site 1	Site 2	Site 3	Site 4	Site 5
340	201	175	150	124	100	75
360	204	177	152	126	101	76
380	206	180	154	128	103	77
400	209	182	156	130	104	78

Site 6 = woodland forest types that are not productive, used to indicate that this plot is a non-productive forest type, non-industrial species. This is used in the estimation of Forest Survey Site class = less than 20 cubic feet of industrial wood, and for the tree height dubbing routine, and in the top vegetation layer – potential height routine.

Site 7 = non-forest, non-productive types. This is also used in the estimation of Forest Survey Site class = less than 20 cubic feet, non-forest, and in the top vegetation layer – potential height routine.

TABLE 8. SITE CLASS IN AREAS OF CONIFER AND MIXED HARDWOOD CONIFER FOREST THAT WERE IDENTIFIED TO HAVE BURNED WITH GREATER THAN 50 PERCENT BASAL AREA LOSS ON THE ELDORADO NATIONAL FOREST

Cover Type and R-5 Site Class	>90% Mortality	50% to <75% Mortality	75% to <90% Mortality	Grand Total
0	191	45	25	**261**
1	6,923	584	396	**7,903**
2	11,851	1,078	710	**13,640**
3	3,891	253	182	**4,326**
4	794	61	42	**896**
5	439	59	43	**541**
6	0	2	0	**3**
Grand Total	**24,090**	**2,082**	**1,397**	**27,570**

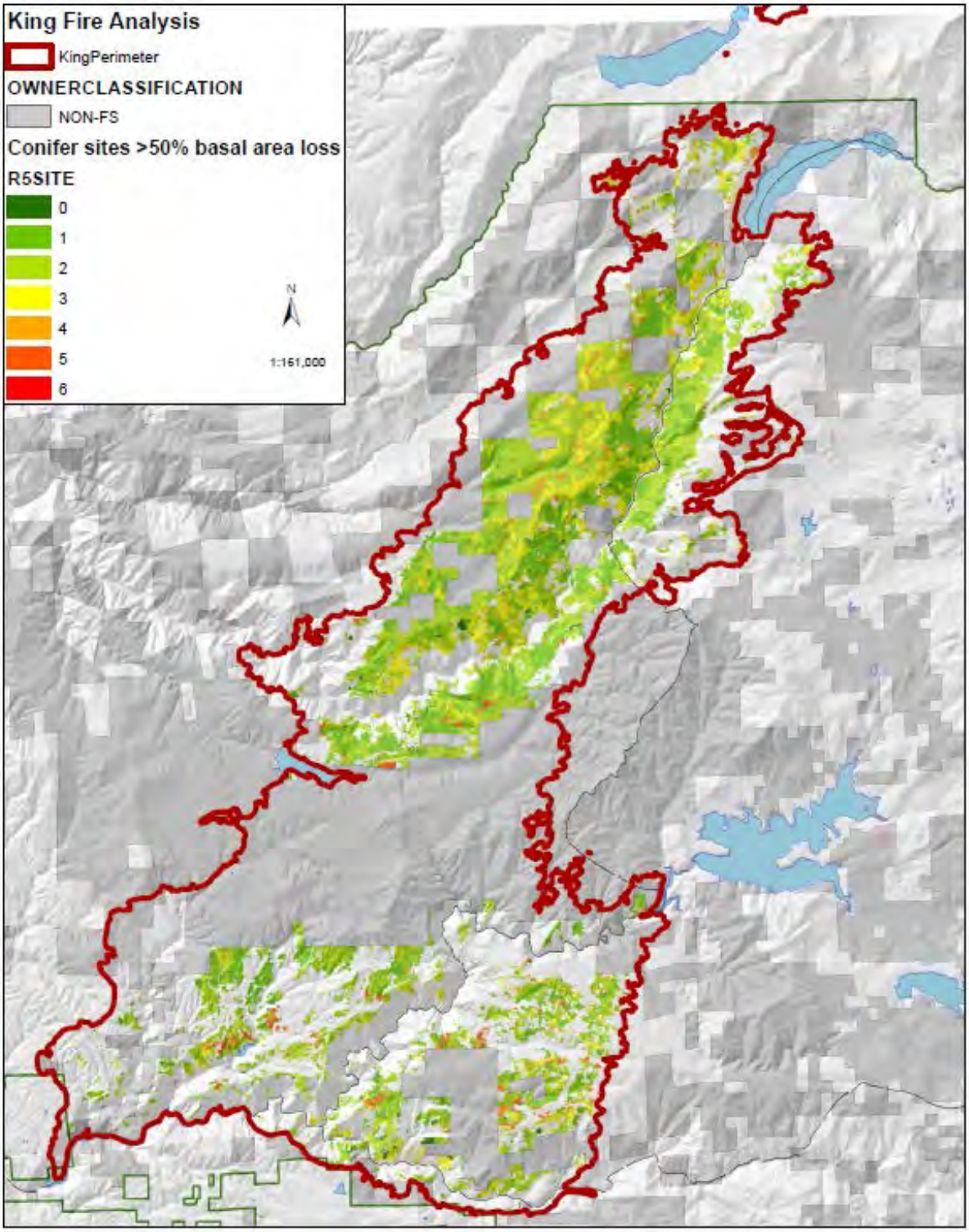

FIGURE 9. REGION 5 SITE CLASS THE ELDORADO NATIONAL FORESTWITHIN THE KING FIRE PERIMETER

DIRECTION

NATIONAL FOREST MANAGEMENT ACT OF 1976

It is the policy of the Congress that all forested lands in the National Forest System be maintained in appropriate forest cover with species of trees, degree of stocking, rate of growth, and conditions of stand designed to secure the maximum benefits of multiple use sustained yield management in accordance with land management plans.

FOREST PLAN – 2004 SIERRA NEVADA FOREST PLAN AMMENDMENT

Accelerate development of old forest
Increase heterogeneity
Promote shade intolerant pines and hardwoods
Reduce risk of loss to fire *(reduce rate of spread, intensity, and mortality)*
0-2X (0-11" dbh) Plantations
Small fuels (<3") @ less than 5 tons per acre
Well-spaced tree crowns (e.g. approximately 200 tpa in 4" dbh trees)
< 50% cover in brush
Tree mortality <50% under 90 percentile weather event

R5 MINIMUM AND RECOMMENDED STOCKING FSH 2409.26B REFORESTATION HANDBOOK, 4.11

Forest Type	R-5 Site Class	Min. TPA	Recommended TPA
Ponderosa and Jeffrey Pine	0 and 1	150	200
	2	125	200
	3	100	150
	4,5	75	125
Red/White Fir	All	200	300
Douglas-fir	All	125	225
Mixed Conifer	All	150	200
Other	Forest Sup may establish as needed		

A certified silviculturist can approve alternative stocking levels based on a site-specific prescription.

RECOMMENDATIONS

Where natural regeneration is unlikely to be reliable to achieve future desired conditions within a desirable timeframe, prioritize reforestation efforts where past, pre-fire, and future climate information, and site class indicate that coniferous forest stands likely to be more sustainable and resilient into the future.

Areas that were identified as having a probability for natural regeneration should be allowed to transition through the natural stages of succession.

All areas that were identified as previously dominated by hardwoods and chaparral in the Wieslander composition mapping should be considered as a possible area of expansion.

Recognizing that future climate change will likely result in an increase in fire ignitions and area burned, consider maintaining areas that have a hardwood or chaparral component recognizing that they will be respond favorably to future high severity fire

Locations identified as high probability (>99%) of being outside the bioclimatic envelope should be allowed to naturally secede to more drought tolerant species

Focus reforestation densities and arrangement to trend stands toward desired future conditions

Reforestation and release efforts should consider resource management objectives along with slope, aspect, and landscape position in concepts presented in PSW GTR 220 and PSW GTR 237 in relation to density and species composition.

Focus release efforts to promote growth and development of forest stands where future forested conditions are identified as a desired condition.

In fire-prone areas, favor rapid development of fire-resistant stand structures ensuring reforestation strategies allow for rapid reintroduction of fire into the burned landscape at various scales.

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APPENDIX C

FIRE MANAGEMENT STRATEGY WITHIN THE KING FIRE

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BECKY ESTES, CENTRAL SIERRA PROVINCE ECOLOGIST, ELDORADO NATIONAL FOREST

KYLE JACOBSON, FOREST FUELS SPECIALIST, ELDORADO NATIONAL FOREST

ROB SCOTT, FUELS BATTALION CHIEF, ELDORADO NATIONAL FOREST

INTRODUCTION

The King fire started on National Forest System land within Calfire Direct Protection Area during the late afternoon September 13, 2014. During the overnight hours, the rollout into steep terrain of the South Fork of the American River caused the fire to grow in size and become inaccessible for direct attack. The following afternoon, the fire spotted across the South Fork American River rapidly growing in size and moving through the community of White Meadows and Silver Creek drainage. Over the course of three days the fire progressed laterally west toward the community of Swansboro and east toward Ice House Road. Significant fire growth occurred to the North on September 17, moving approximately 50,000 acres in a 24-hour period and covering 10 miles. A precipitation event slowed fire spread allowing fire suppression resources to complete direct line around the fire.

Fire is an ecological process that promotes resilience in Sierra Nevada forests. Fire was once very common throughout the Sierra Nevada and provided a primary force for shaping the structure, composition, and function of ecosystems. Future management strategies need to address the use of fire as a viable fuel-treatment tool (Agee and Skinner 2005; Stephens et al. 2009) a means to achieve large-scale prescribed burning and an important restoration treatment for many ecosystem processes stalled by the absence of frequent burning (North et al. 2012).

After the King Fire, the Eldorado National Forest (ENF) recognized the need to identify a strategy for managing activities within and adjacent to the footprint of the fire to assist with future fire management of planned and unplanned ignitions. This document is dynamic so that as new science and planning documents become available, updates can be made to reflect these changes on the landscape. The strategy is working toward desired conditions that are consistent with current ENF forest plan and the Sierra Nevada Forest Plan Amendment (SNFPA). Additionally, the strategy strives to: 1) provide resilient forest communities to predictable occurrence of future fires, 2) provide sustainable habitat for native biotic communities, and 3) reduce the risk of large-scale disturbances that have the potential to impact communities, watersheds, and ecosystems.

BACKGROUND

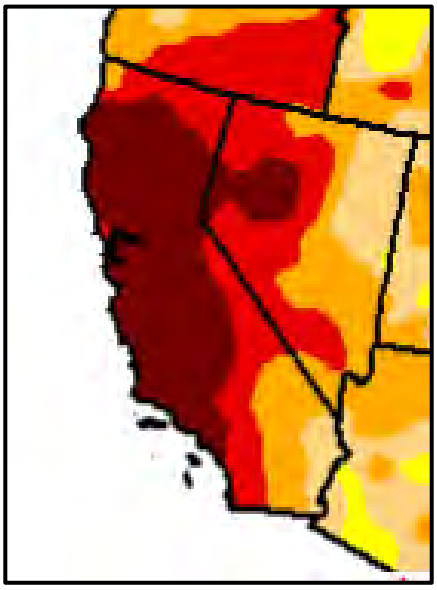


Figure 4. September 9 US Drought Monitor

WEATHER AND FUEL CONDITIONS

The combination of fuels, weather, drought, and topography affected fire behavior and ultimately containment of the King Fire. Steep inaccessible terrain hampered suppression efforts during initial attack as the fire rolled out downslope into terrain that was inaccessible to ground resources, quickly growing in size and impacting numerous communities and natural resources across the landscape. Fuel conditions can be categorized as extremely dry as much of California was in "Exceptional Drought" (Figure 4). Precipitation for the previous two years was at 50 to 70 percent of normal (NOAA 2014). A general lack of precipitation during the winter and spring 2014 led to an early fire season and extended period of fuels exposed to drying, especially large downed woody material (i.e., logs). Figure 2 displays a graph representing large fuel moisture conditions and Energy Release Component Values representing fire danger potential. Fuel conditions were well above 97th percentile weather conditions for the first three days of the King Fire. Figure displays Burning Index and weather conditions within the same timeframe. What can be seen from both figures is fuel and weather conditions were aligned in a condition to promote extreme fire behavior as fuel conditions were above 90th and 97th percentile and weather conditions were dry with wind gusts up to 34 mph.

Forest vegetation at this time showed signs of stress as needles were fading and brush species browning but leaves remaining attached to the shrub (Figure).

FIGURE 5. TIME SERIES GRAPH DISPLAYING ENERGY RELEASE COMPONENT AND 1000-HOUR FUEL MOISTURES OVER A 7-DAY PERIOD.

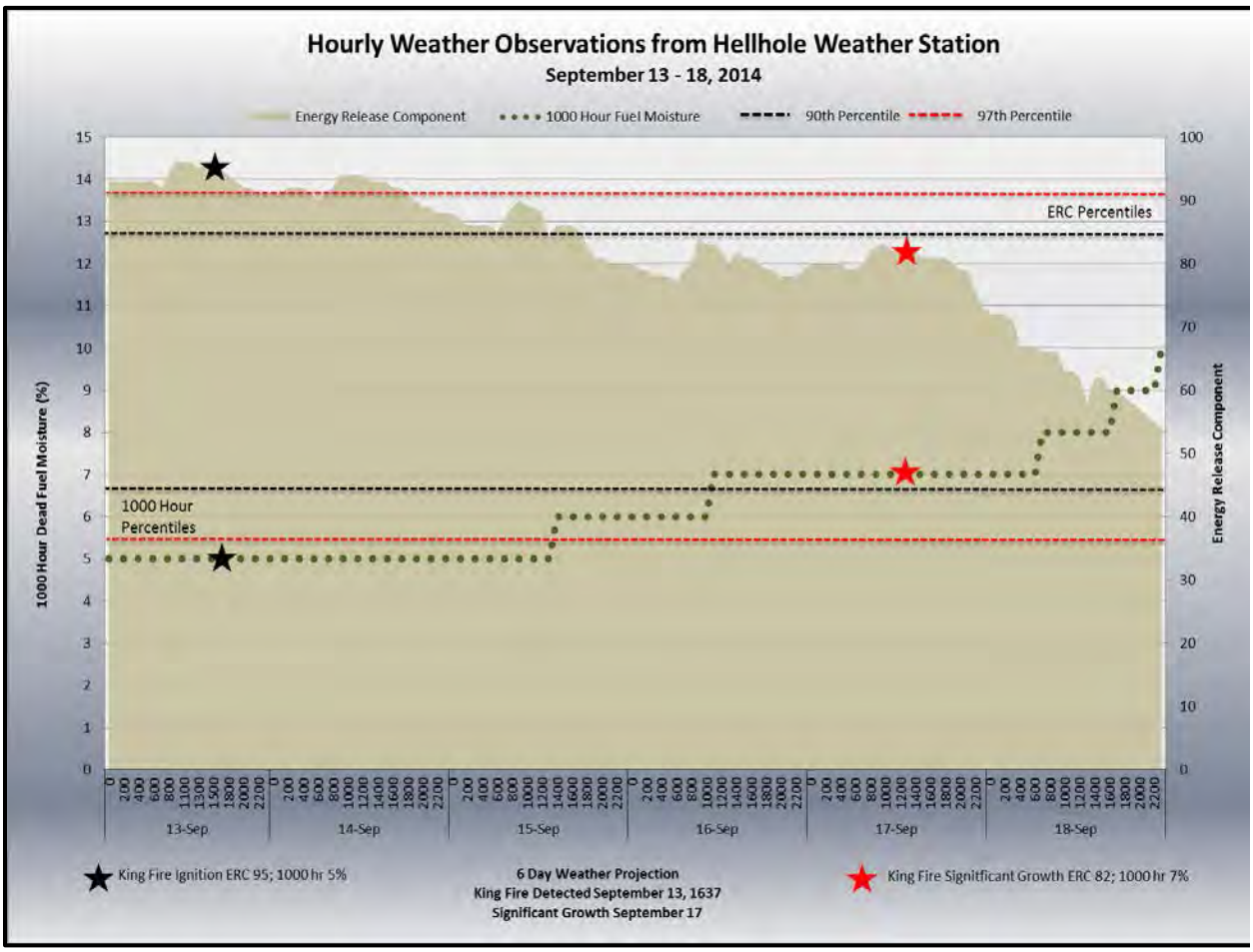


FIGURE 3. VISUAL DISPLAY OF DROUGHT STRESSED VEGETATION

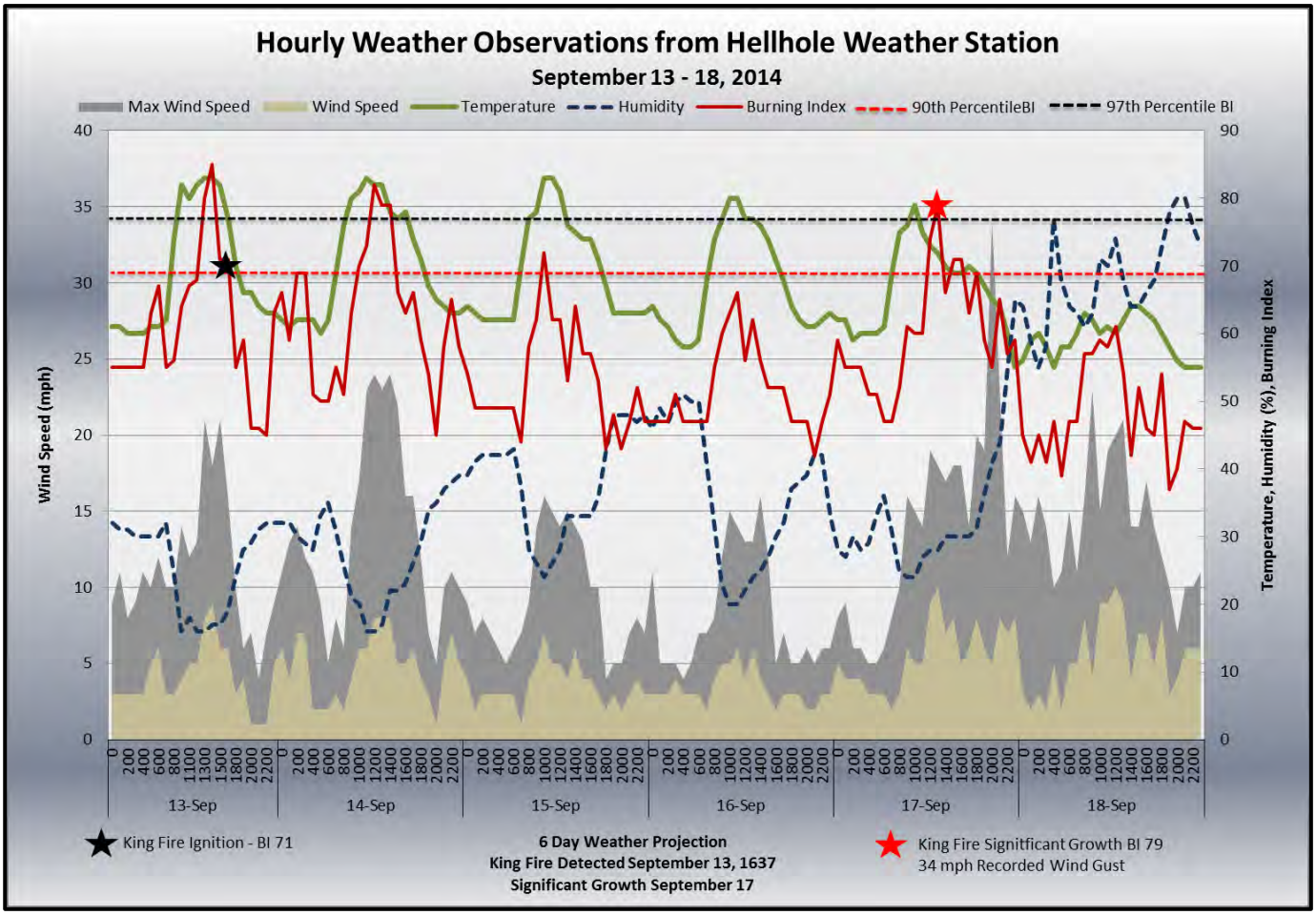
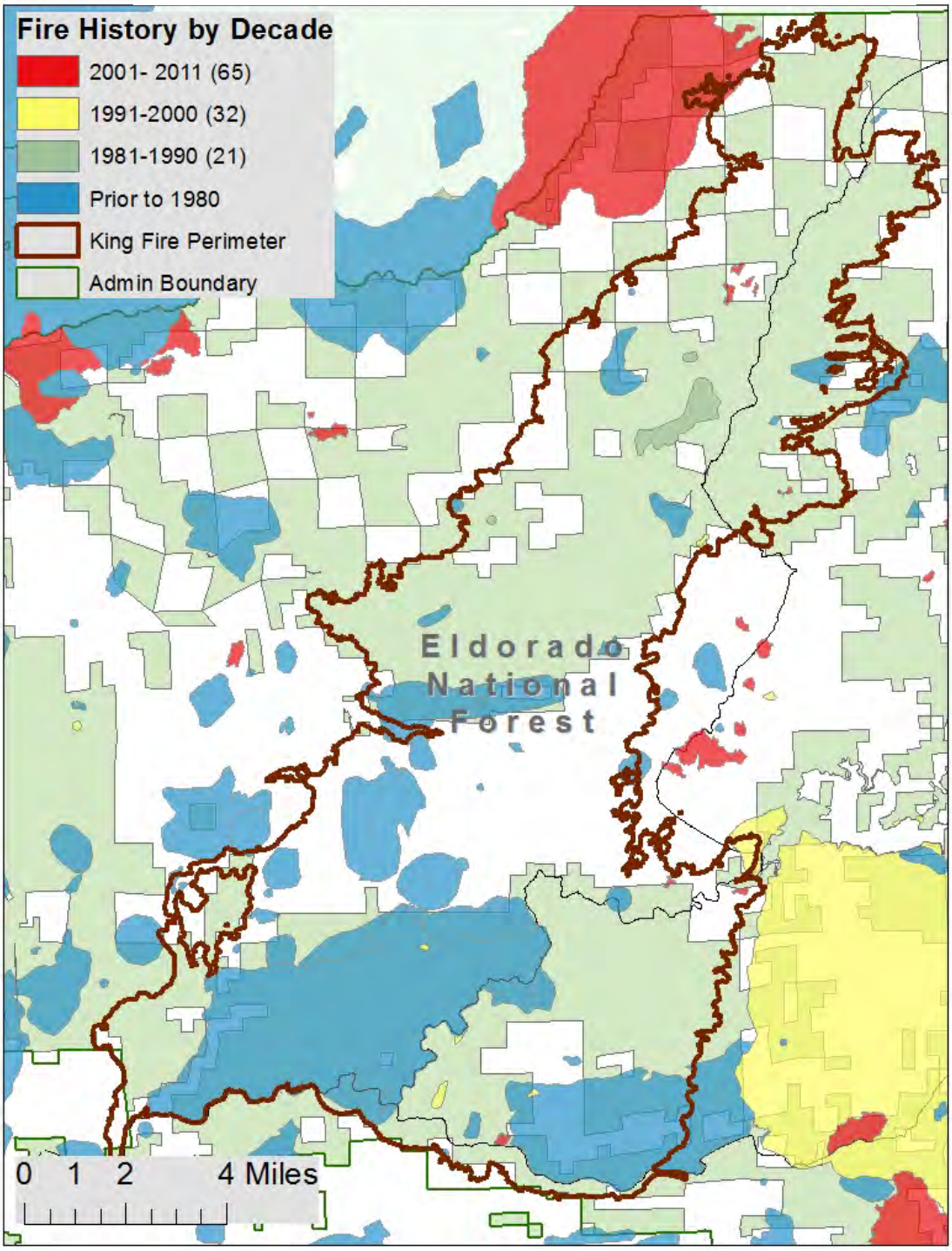


Figure 4. Weather conditions during the course of the king fire

Figure 5. Fire history in the king fire perimeter



FUEL CONDITIONS PRIOR TO THE KING FIRE

Prior to the fire, a mix of forested and non-forested vegetation existed within the King Fire Area. A large mix of the fire area had not seen fire in over 100 years (Figure 5). Within the southern portion of the fire area, the 1992 Cleveland Fire and 1959 Ice House Fire were the last large fires recorded in the fire area. Forest management activities differ upon the landscape and private timberlands intermix National Forest System Lands. Within unmanaged forested vegetation, ground fuels had high duff loadings along with large amounts of surface fuel accumulations. Extending into the mid-story canopy, small saplings and shrubs provided a uniform and continuous fuel bed into the overstory canopy fuels (Figure 6). The conditions within the King Fire have been documented throughout Sierra mixed conifer forests where fire has been excluded (Collins et al. 2011; Knapp et al. 2013).

Figure 6. stand conditions within unmanaged forested environments with little natural disturbance.

Plantations ranged in age, dependent on locations. On NFS lands, within the southern portion of the fire, plantations ranged from 20 to 50 years. Some areas were planted after the Ice House Fire (1959) and Cleveland Fire (1992). Plantation conditions depend on management activities and age as older plantations generally have open understory fuel conditions as overstory canopies shaded out the understory. In unmanaged areas and younger plantations, brush intermixed between trees creating uniform fuel beds (Figure 7).

Fuels reduction projects that have aimed to reduce surface fuel loading and overall spread and intensity of fires has been occurring within the fire area for the previous 20 years. Recent treatments have aimed to reduce fire spread and intensity by reducing natural accumulations of surface fuel loadings and thinning understory vegetation to reduce the likelihood of crown fire initiation (Figure 8).

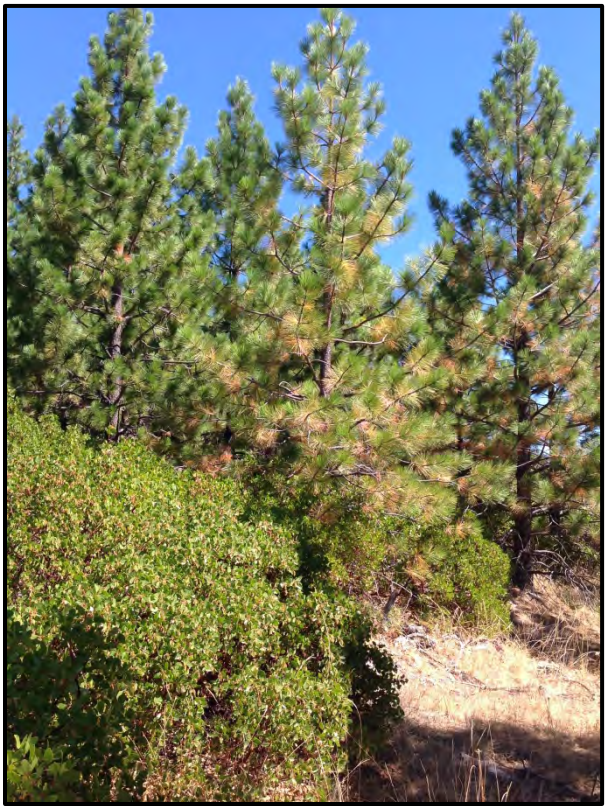


Figure 7. Plantation stand adjacent to the King fire with grass and brush understory.

Figure 8. Example of fuels reduction treatments removing understory vegetation and increasing canopy base heights.

FIRE MANAGEMENT STRATEGIES AND TACTICS

During the course of the fire, Incident Management Teams utilized a combination of strategies to contain the King Fire. Direct tactics were initially used until the fire escaped initial attack, spreading into inaccessible terrain and exhibiting extreme fire behavior (Spotting >1 mile; sustained crown runs). Once direct tactics became infeasible and the fire size exceeded the capacity of fire fighters to control the fire, indirect strategies were utilized to give resources an upper hand to get ahead of the main fire to identify control lines. This strategy provided an area to safely deploy resources to implement line construction activities and prepare fire lines for burnout operations which ignites a backing fire toward the advancing main fire. Specifically, fire managers identified:

- Road Systems – Provide quick access to control line with generally minimal line construction preparation and the ability to utilize fire engines to support holding with water support. Examples include Wentworth Springs Road, Ice House Road, Sand Mountain Boulevard.
- Ridge Systems – Generally provide access to heavy equipment and air resource support providing natural locations to burnout ahead of the main fire. Peavine, Poho, and Nevada Point Ridges are locations fire managers identified as potential ridges to hold the fire on.
- Fuels Treatments – Recent wildfires, mechanical thinning, and prescribed burn projects where fuels have been treated and can allow for quick line construction as fuel load and structure area favorable to reducing fire spread and intensity.
- Natural Features – Lakes, rivers, or barren ground that can facilitate control of line locations or places to anchor control lines from.

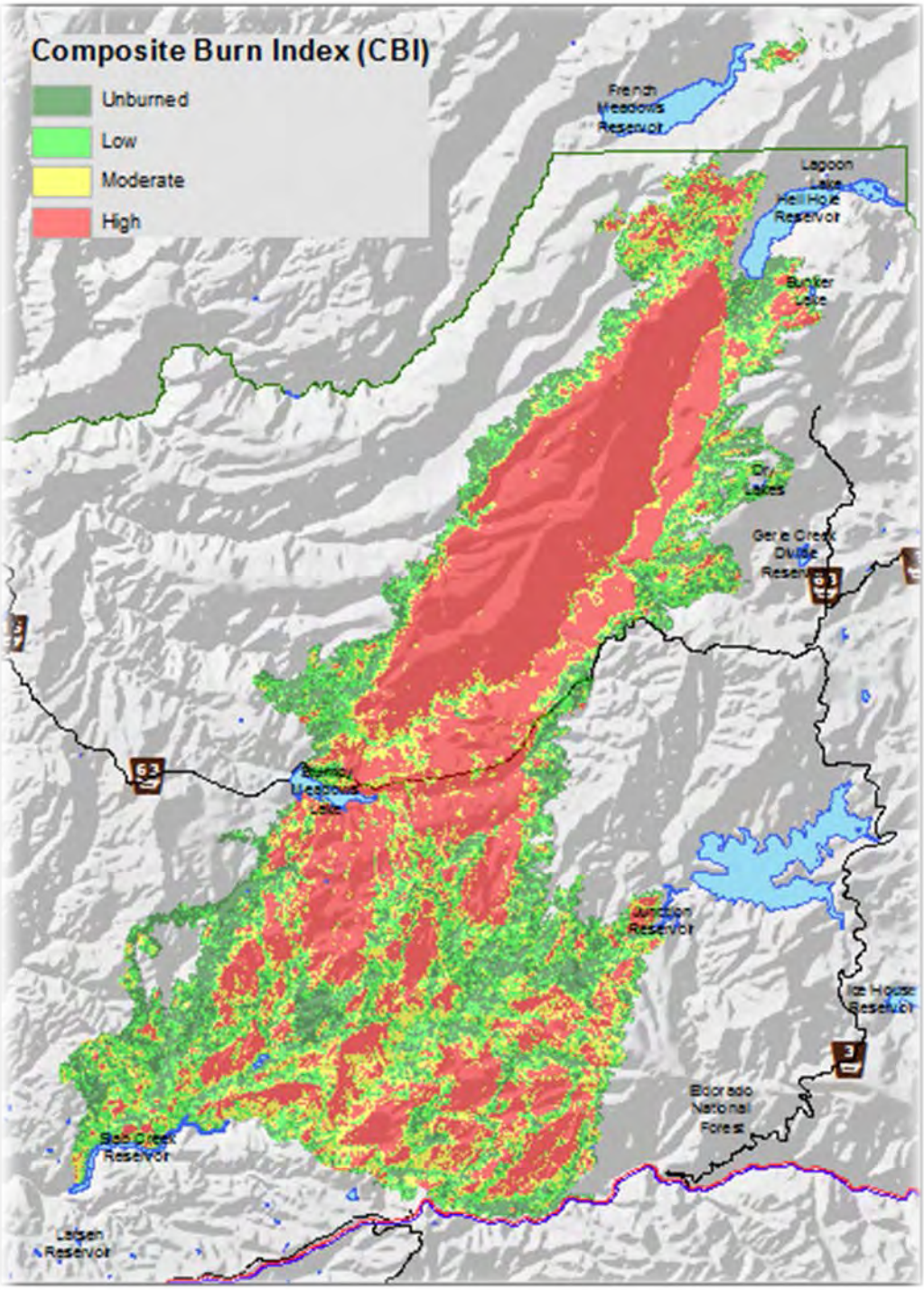
A combination of the above features were utilized to contain the King Fire with ultimately direct line construction being completed when fire behavior subsided as a result of cool moist weather. The key element is that fire managers naturally gravitate to the above features to contain a fire when direct line construction is not an option; more importantly, in frequent fire ecosystems, on many occasions these same strategic features are utilized repeatedly. The King Fire is an example in which contingency lines were constructed in locations originally utilized during the Ralston Fire (2006).

POST-FIRE FUELS CONDITIONS

The King Fire experienced a mix of severity across the landscape. Predominately the northern section of the fire area from Saddle Mountain to Hellhole experienced high severity fire effects (>75% basal area loss) with the flanks of the fire in the same area representing a mix of low and moderate fire severity (Figure 9). A detailed account of the fire can be found in the King Fire Fuel Treatment Effectiveness Report (Ebert et al. 2015).

The southern portion of the fire area burned in at mixed vegetative fire severity with pockets of high severity fire patches. Low to moderate severity burn areas intermix high severity areas to break the continuity of high severity patches compared to the northern portion of the fire area.

Figure 9. Preliminary vegetation severity map (RAVG) classified by the Composite Burn Index (CBI).



High Severity fire areas experienced crown fire activity resulting in full consumption of ground, surface, and aerial canopy fuels. At the ground and surface fuel level, duff and needle cast, small branches, and large downed woody material were fully consumed; in the canopy stratum, full consumption of leaf and needle foliage occurred leaving standing dead trees and barren soils (Figure 10 and Figure 11).

FIGURE 10. EXAMPLE OF HIGH SEVERITY FIRE EFFECTS.

Moderate to high severity fire areas experienced similar conditions; surface fuel loadings were primarily fully consumed; pockets of larger downed fuels remain visible on the surface. Generally, full consumption occurred within all categories of surface fuel loads (i.e., small branches, twigs, and large downed woody debris); and dead needles continue to fall from the canopy covering the forest floor (Figure 12). The crown fuel profile varied with some trees being consumed by the fire and other trees retaining needles in the tree canopy (Figure 13).

The majority of aerial canopy structure burned intensely enough to result in brown needles with few green needles remaining on conifer trees and full consumption of hardwood species.

FIGURE 11. CANOPY VIEW OF HIGH FIRE SEVERITY PATCH.

FIGURE 12. MODERATE TO HIGH SEVERITY FIRE WITHIN SURFACE AND MID-STORY CANOPY FUELS.

FIGURE 63. MODERATE TO HIGH SEVERITY FIRE WITHIN THE CANOPY FUELS.

Low to moderate severity stands have a mix of live and dead trees remaining within the understory. Primarily, overstory crown fuels remain intact and survived the fire while surface fuels and small tree (understory) mortality occurred within the understory crown fuel profile (Figure 14).

FIGURE 14. LOW SEVERITY FIRE EFFECTS

POST-FIRE FUELS MANAGEMENT STRATEGY

BACKGROUND/ASSUMPTIONS

The King Fire highlighted the effectiveness of fuels treatments that aimed to reduce the spread and intensity of fire. During the course of the fire, fire mangers utilized multiple fuel treatment areas in their effort to contain the fire. Poho Ridge which included the Hey Joe Fuels Reduction Project and Purple Haze Mastication Project were utilized as areas to build fire line with planned burnout operations. Ultimately, portions of the Quintette and Treeage Fuels Reduction Projects assisted to facilitate line construction and successful burnout operations.

This paper assumes that within high severity patches we can expect grass and shrubs to reestablish in once forested conifer stands. Within low to moderate severity areas that still remain forested, accumulation of foliage and small woody material will continue to increase over time along with regrowth of shade tolerant vegetation in the absence of fire or other forest management activities.

Experience from previous large fires across the Sierra Nevada shows that areas which encountered high severity fire can be ready to reburn again in as little as 10 years. The Chips Fire (Plumas NF, 2012) burned within the footprint of the Storrie Fire (2000); the Kyburz Fire (Eldorado NF, 2013) burned within the Freds Fire (2004) and the Big Meadow Fire (Yosemite NP, 2009) burned within the 1996 A-Rock Fire scar. These examples highlight the fact that we can assume reburn within the King Fire area is probable as early as 10 to 20 years.

Based on these assumptions, without any management activities we can expect high severity fire areas to reestablish with non-forested vegetation, mainly shrub fuels, with standing dead timber, for the next 10 to 20 years, or longer, and promote problem fire behavior and high resistance to control. Over time, snags will fall and contribute to surface fuel loading and subsequent fire behavior as these materials continue to decay becoming readily available to ignition and long duration, high intensity burning.

The King Fire Management Strategy was designed to identify locations where managing activities within and adjacent to the footprint of the fire will help to assist with future fire management of planned and unplanned ignitions. From a fire management perspective, there is a need to manage portions of the post-fire landscape in order to facilitate future fire management activities which includes managing planned and unplanned fire ignitions (Figure 15).

IMPORTANCE OF PRESCRIBED AND MANAGED FIRE

Fire is an indispensable management tool, capable of doing much of the work to restore ecological processes (Covington et al. 1997; Stephenson 1999; Sugihara et al. 2006; North et al. 2012). Prescribed and managed fire has also been identified as the primary means to treat large landscapes particularly in areas where mechanical treatment are limited due to access (North et al. 2012).

In many stands, mechanical thinning followed by prescribed fire may be necessary to achieve forest resilience much faster than with prescribed fire alone (Stephens et al. 2009). Surface fuels merit as much attention as ladder fuels when stands are treated. Prescribed fire is generally the most effective tool for reducing surface fuels. Recent research has also shown that prescribed fire treatments either before or following plantation establishment can increase the likelihood of survival following a fire (Kobziar et al. 2009).

Following large-scale fires, an opportunity exists to define a landscape-scale strategy to realign fire treatments within the area (Figure 14). Prescribed fire units can be defined as part of the fire shed analysis based on fire behavior modeling and expert opinion. The units could have three primary objectives: 1) reintroduction of fire on a short rotation interval to break up the continuity of post-fire fuels, 2) maintenance of areas that burned at low and moderate severity within the pre-European fire return interval, and 3) facilitate prescribed fire in projects under previous decisions.

RECOMMENDATIONS

Utilize local fire management and fire history to identify strategic fire management areas, which will identify locations to reduce the spread and intensity of fires and allow for safe and effective fire suppression activities on future planned and unplanned ignitions.

Wildland Urban Interface

Strategic Fire Management Areas

Strategic Road Systems

Natural Barriers

Focus the greatest intensity of fuel treatments within the Wildland Urban Interface focusing on providing safe ingress/egress of public and fire suppression resources and reducing snag densities and surface fuel loading to reduce problem fire behavior; namely, spot fire ignition, reduction of flame lengths to less than four feet and surface fuel loadings that reduce the spread of wildland fires which allows quick suppression response to contain fire as soon as possible.

Identify fuels treatments that aim to reduce future fire behavior including flame length, intensity, crown fire initiation, and spot fire potential.

Develop fuels treatments to reduce the stand density of snags and subsequent surface fuel loading potential these standing dead trees are storing.

Within low to moderate severity burn areas, cut and pile dead vegetation and prune the canopy of retained trees to decrease future connectivity of surface and canopy fuels.

Reduce snag densities to the least number of snags needed for other physical and biological processes maintaining any snags retained in clumps.

Actively manage these areas in the future as vegetation reestablishes and grows to maintain a system of strategic management areas to contain future fires.

Consider the footprint of the King Fire as a place to reinitiate prescribed fire on a larger scale.

Utilize prescribed fire as a second entry to retain frequent low intensity fire regimes, especially within low and moderate severity fire areas.

Continue to utilize fire within the Hey Joe, Quintette, and Treeage Fuels Reduction Projects along with numerous fuels treatments along Peavine Ridge and Jay Bird Road to maintain already low surface fuel loadings, and continue frequent low intensity burns.

Utilized prescribed fire to break the continuity of shrub regrowth in areas where other forest management activities are not feasible.

Utilize aerial ignition within the Rubicon River drainage (i.e., helitorch) to create patches of burn areas where anticipated vegetation is continuous shrubfields.

Coordinate with other resources to develop management activities that continue to support fire management strategies.

Reforestation is an important component in ecological restoration goals to restore forested vegetation.

Identify planting methods and locations of reforestation and focus future management activities within forested areas to maintain low surface fuel loadings and as soon as practical prune vegetation to increase canopy base heights and break the continuity of fuels both horizontally and vertically.

Identify desired conditions for surface fuel loadings for fire management coordinating with other resource specialties to maintain physical and biological processes in the ecosystem.

Identify future fuels reduction projects outside of the footprint that can connect with treatments in the King Fire area.

Reduce surface fuel loading.

Increase canopy base height.

Break continuity of overstory crown fuels, especially near the edge of steep canyons and drainages.

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APPENDIX C

CONTRIBUTION OF FIRE MODELING TO THE OVERALL FUELS TREATMENT STRATEGY ON THE KING FIRE

METHODOLOGY

FIRE MODELING

Modeling fire growth across the landscape provides an opportunity to visually look at the growth potential under a set of weather conditions. The FlamMap fire behavior modeling program provides the option of visually observing "major flow paths" utilizing the Minimum Travel Time Fire Growth Model. In essence, these flow paths are the prediction a fire would travel given the weather, fuels and topography inputs required by FlamMap and an ignition on the landscape. What is unique about FlamMap is the modeling can be looked at under one set of weather conditions; therefore, the alternatives can be compared under one set of conditions.

The Minimum Travel Time (MTT) feature is a two-dimensional fire growth model. It calculates fire growth and behavior by searching for the set of pathways with minimum fire spread times from point, line, or polygon ignition sources. In theory, the results are identical to wave-front expansion used in *FARSITE* with the exception that all weather and fuel moisture conditions are held constant over time with MTT, but allowed to vary in time in *FARSITE*.

At a user specified resolution of data cells, the algorithm finds the minimum travel paths by calculating travel times from each node (cell corners) to every other node on the landscape. Travel pathways are straight lines that connect nodes and intersect cells to form segments for which fire behavior is calculated from the input data (Finney et al. 2006).

The importance of looking at the major flow paths of a modeled fire can provide insight into specific areas on the landscape where a combination of fuels and topography may branch into multiple flow paths. Thus, the MTT calculations can generate fire growth in the absence of time-varying winds or moisture content which enables analysis only of the effects of spatial patterns of fuels and topography (Finney, 2006).

Pre-fire fuel models are utilized to model potential fire behavior for this project. The idea of the fuels strategy is to identify those areas that have the potential risk of large fire growth in the future; utilizing the pre-fire models allows fire managers to identify future problem fire areas. It is assumed that vegetation will establish and grow overtime. While there may be a species composition change, it is anticipated that there will be an issue with surface fuel loading and subsequent fire behavior over time.

To model predicted fire behavior, a climatological weather was utilized to obtain 90th percentile weather conditions in the vicinity of the King Fire. Both the Bald Mountain and Hellhole Remote Automated Weather Stations were used to develop weather and fuel moisture inputs for use in modeling fire behavior (Table 4). For the purposes of modeling, wind speed was chosen at 25 mph with upslope winds. During the September 17 large fire growth day, winds at the Hellhole RAWS were recorded at 12 mph, gusting to 34 mph.

TABLE 4. 90TH PERCENTILE WEATHER CONDITIONS WITHIN THE KING FIRE AREA

90th Percentile Weather Bald Mountain & Hellhole RAWS	
1 - Hour Dead Fuel Moisture	3%
10 - Hour Dead Fuel Moisture	4%
100 - Hour Dead Fuel Moisture	5%
1000 - Hour Dead Fuel Moisture	6%
Live Woody Fuel Moisture	69%
Herbaceous Fuel Moisture	30%

Figures 1-3 highlight the analysis completed to identify strategic fuels zones. Identifying the branching "nodes" within the MTT run assist with fuel zone location placement; the theory being that if we can alter fuels within this area, modifying the fire behavior will reduce chance that the branching of the nodes would occur. As can be seen from the figures, following the branching out, further branching occurs. An example of this is highlighted from the King Fire within the Hey Joe Project Area where 500 acres of prescribed fire was accomplished within and adjacent to mechanical thinned units 10 months prior to the ignition of the King Fire. Fire activity was arrested in the units and what can be observed is the fire entered the stands as active crown fire and modified to surface fire behavior activity. The main fire eventually flanked around the treatment units; however, fuels in the treatment modified fire behavior compared to outside the treated area.

Figure 7. FlamMap minimum travel time run indicating areas of potential growth.

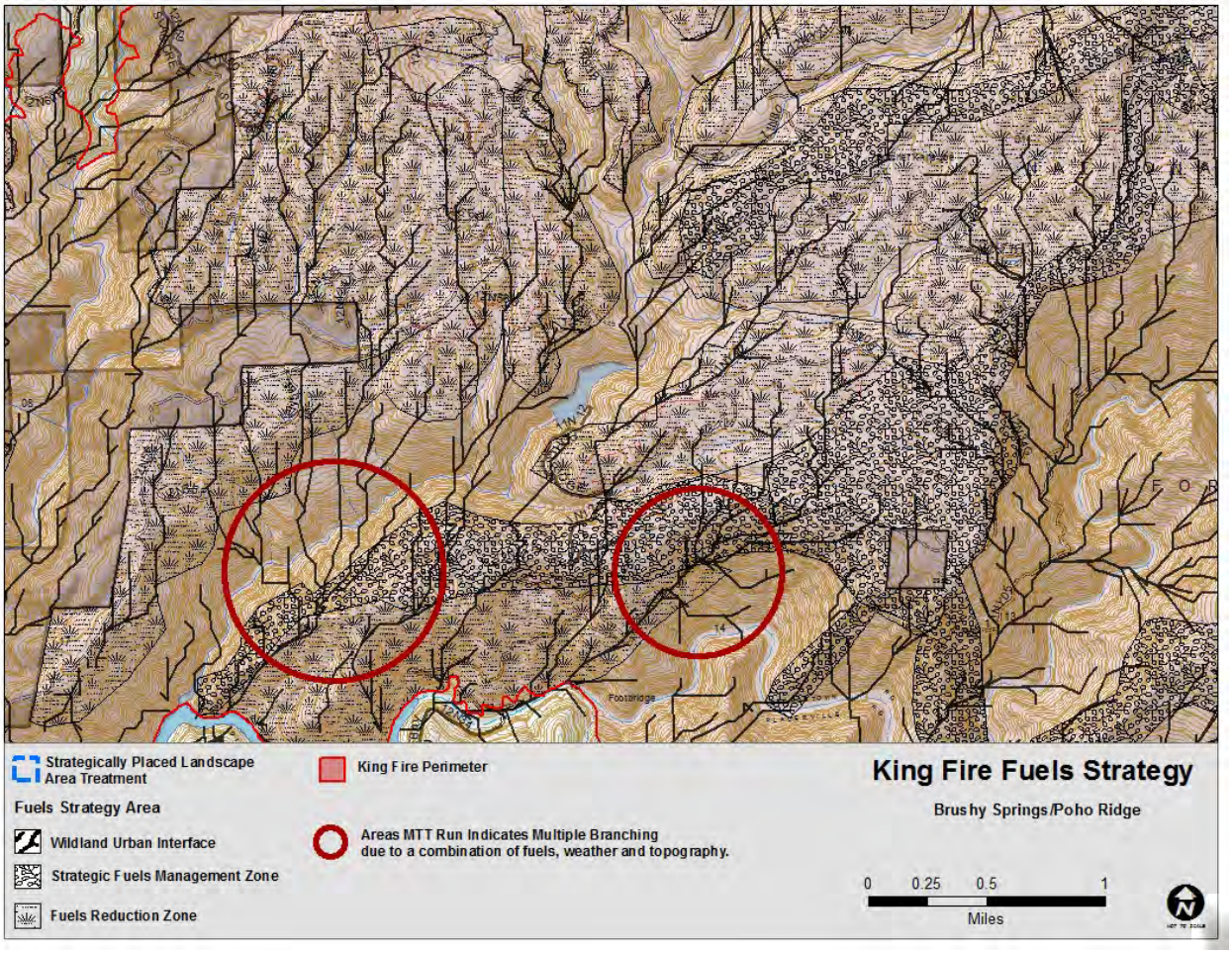


FIGURE 8. FLAMMAP MINIMUM TRAVEL TIME RUN INDICATING AREAS OF POTENTIAL GROWTH.

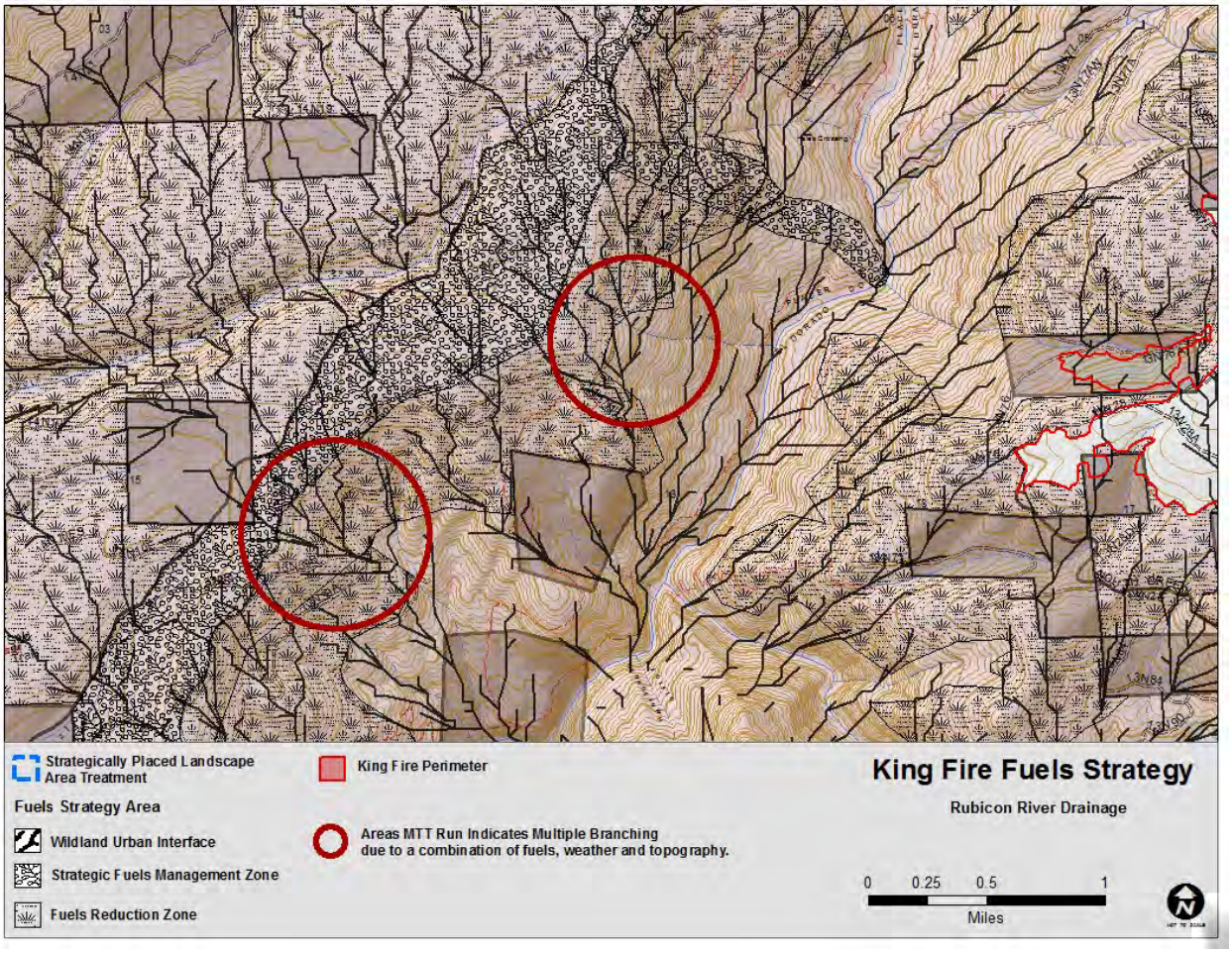
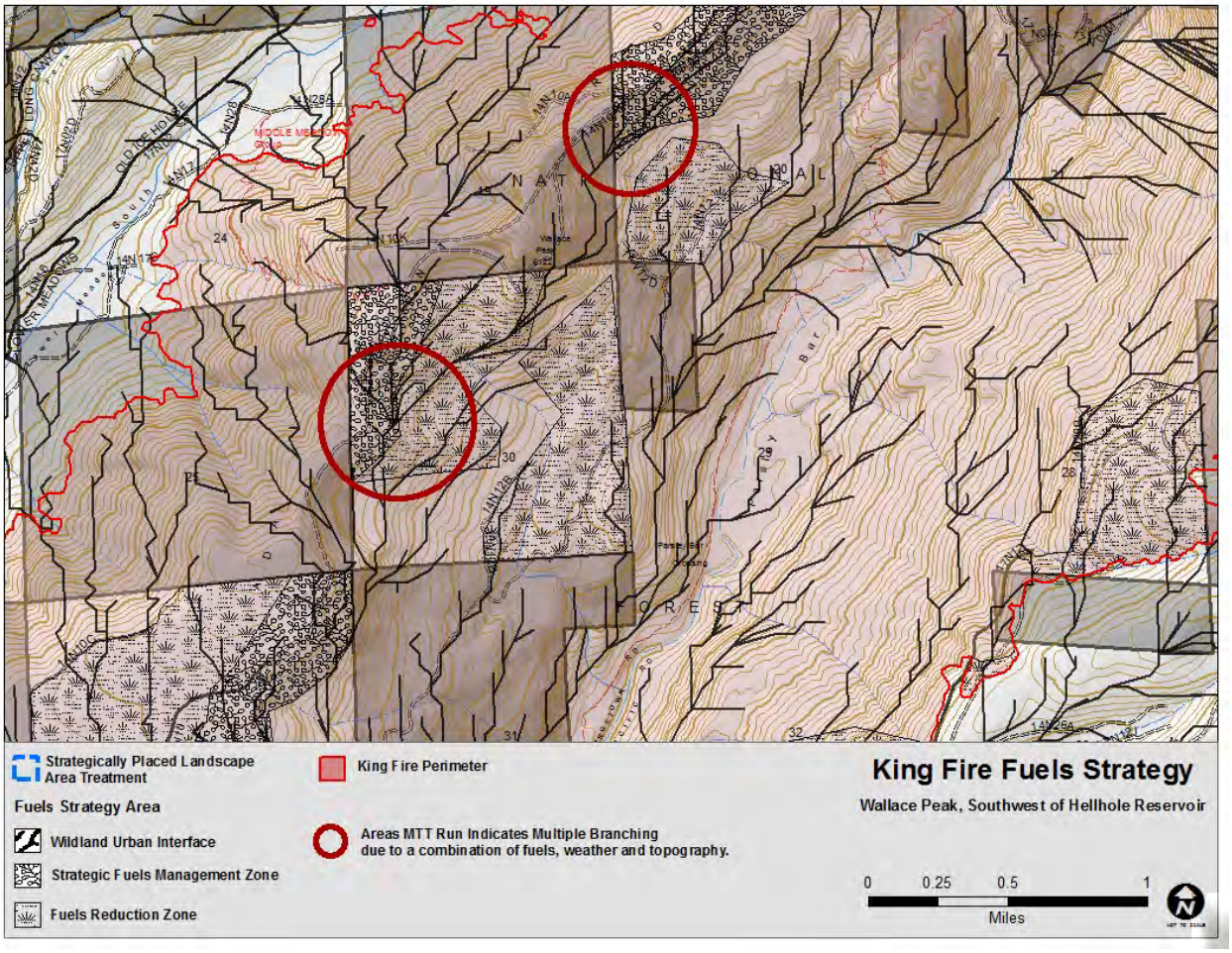


FIGURE 9. FLAMMAP MINIMUM TRAVEL TIME RUN INDICATING AREAS OF POTENTIAL GROWTH.



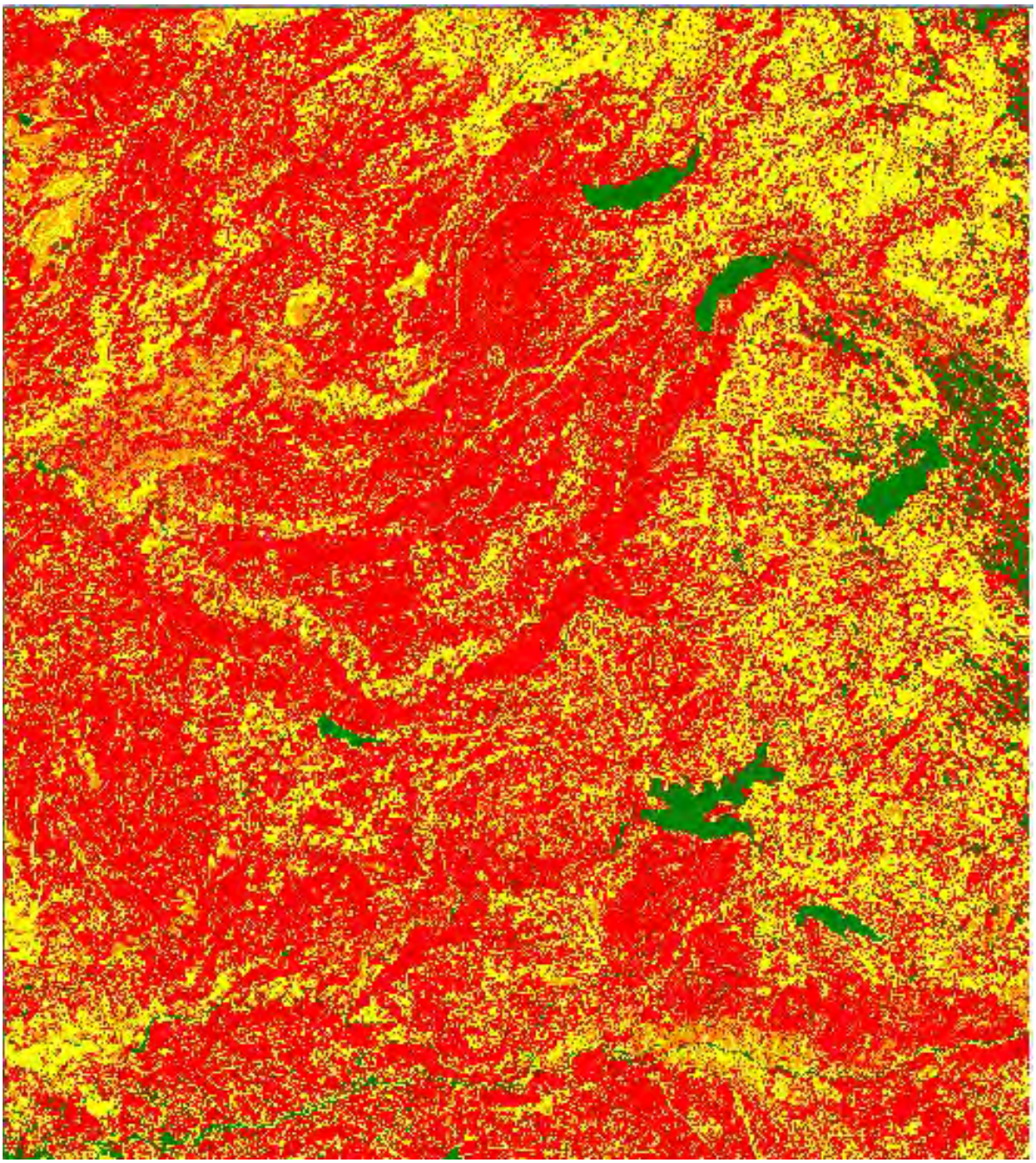


FIGURE 4. FLAMMAPFLAME LENGTH IN THE KING FIRE PERIMETER. RUNS WERE BASED ON PRE-FIRE VEGETATION LAYERS

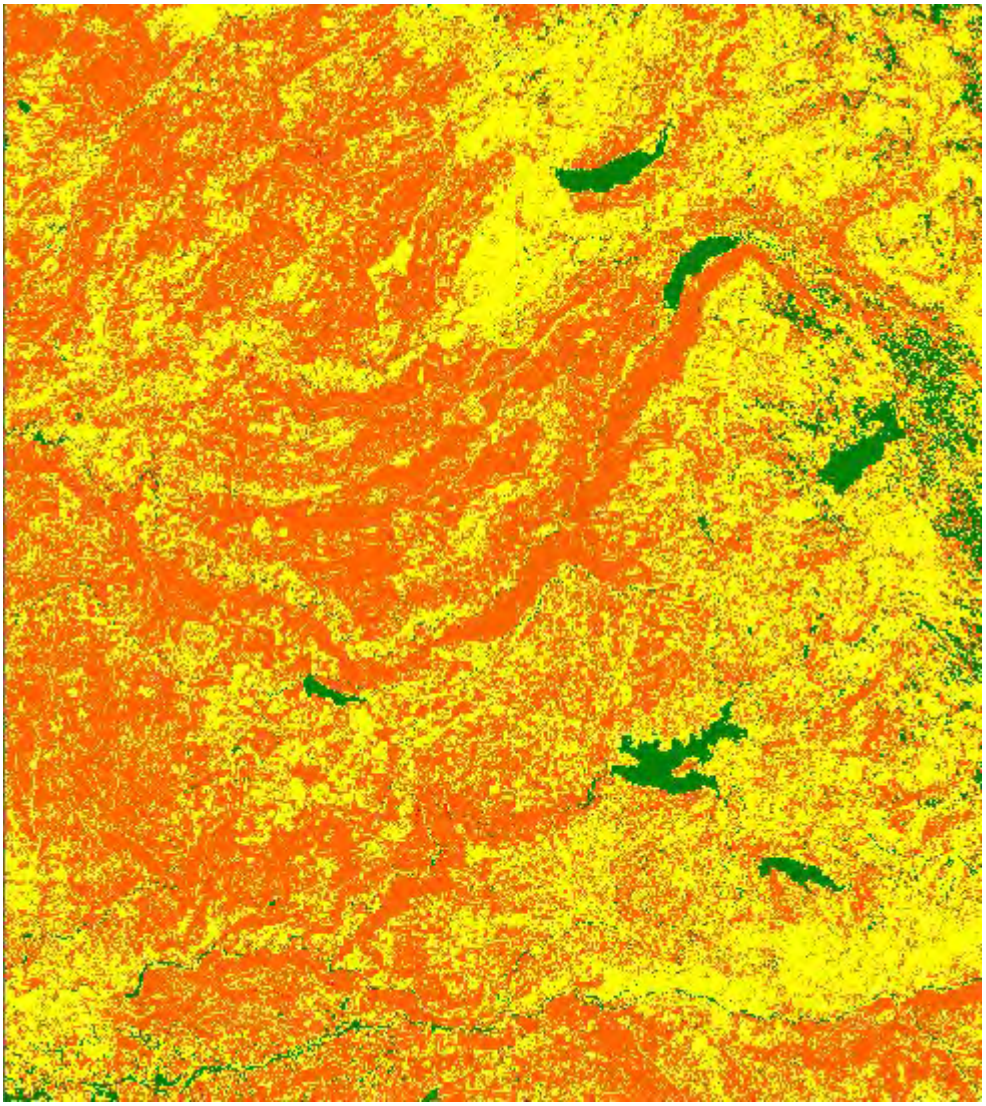


FIGURE 5. FLAMMAPPOTENTIAL FOR CROWN FIRE IN THE KING FIRE PERIMETER. RUNS WERE BASED ON PRE-FIRE VEGETATION LAYERS

PROFESSIONAL JUDGMENT

Utilizing fire and fuels management staff, key geographic locations and feasible areas that could be managed with future treatments were identified. This included the process of identifying ridge systems, roads, and natural features that could be utilized as potential control lines to contain a wildland fire. A review of previous fuels reduction projects was a key indicator to locate important fire management features. The intent of these projects was to reduce surface fuel loading and crown fire activity within the treated areas and facilitate future treatments within the fuels strategy. These documents provided fire modeling to logically support the effects of the proposed treatments on fire behavior, beyond what is shown here.

STRATEGICALLY PLACED LAND AREA TREATMENTS (SPLATS)

Strategically placed [land] area treatments are blocks of land, ranging anywhere from 50 to over 1,000 acres, where the vegetation has been treated to reduce fuel loading. The treatment areas are placed so that a spreading fire does not have a clear path of untreated fuels from the bottom of the slope to the ridge top. Managers consider historic fire regimes and the potential for severe wildfires (based on fuel loading, prevailing wind direction, and terrain features) in deciding where to place area treatments. Strategically placed area treatments are designed to burn at lower intensities and slower rates of spread during wildfires than comparable untreated areas. Hence, wildfires are expected to have lighter impacts and be less damaging in treated areas. The SPLAT strategy treats a relatively large proportion of the landscape, and this strategy facilitates fire reintroduction (Biological Assessment for SNFPA SEIS Final, July 30, 2003). Within the King Fire Perimeter, 12,650 acres of SPLATS have been identified. **TABLE 5** displays the acreages of SPLATS broken out by Fuels Strategy Area.

TABLE 5 ACRES OF SPLATS WITHIN FUELS STRATEGY AREAS.

Fuels Strategy Area	Acres
Wildland Urban Interface	0
Strategic Fuels Management Treatment	3,664
Fuels Reduction Zone	7,237
Total	**10,901**

STRATEGIC FUELS MANAGEMENT STRATEGY

Three types of potential treatment areas were identified based on a combination of factors related to future fire management strategy, fire hazard and risk, and areas where treatments could feasibly be implemented with future activities. Fire managers reviewed Geospatial layers including: Wildland Urban Interface, Road system, LMU, Strategic Placement of Land Area Treatment (SPLATs), and fire modeling outputs including flame length, fire line intensity, and minimum travel time flow paths.

WILDLAND URBAN INTERFACE

In wildland urban intermix (WUI) defense zones, management activities are focused on protecting life and property (Sierra Nevada Frame Work). The following are fire management goals within the WUI zone.

Fire Management Goals

- Reduce future fuel loadings adjacent to WUI Defense Zones (Used WUI layer)
- Retain the least amount of snags possible within the WUI; keep snag locations as far away from homes and road systems.
- Decrease resistance to control of future fires in the WUI by prioritizing projects to reduce surface fuel loading and vertical fuels arrangements that minimize crown fire activity.
- Provide safe areas for ingress/egress of public and firefighters.
- Promote future fuels management projects in the area aimed at reducing fuel loading from future vegetation regrowth.

Any new fire starts would be kept small enough to permit fire suppression resources to quickly suppress fires.

STRATEGIC FUELS MANAGEMENT ZONE

Fire managers utilize strategic locations to contain unplanned ignitions along with facilitating prescribed fire implementation. These features include natural barriers such as lakes and rivers, road and ridge systems.

Fire Management Goals

- Reduce hazardous fuels in key locations to reduce fire spread and intensity.
- Reduce snags and future surface loadings in post high fire severity areas to minimize fire behavior.
- Provide key areas where firefighting resources can utilize locations to establish anchor points to contain wildland fires.
- Hazards to firefighters are reduced by managing snag levels in locations likely to be used for control of fire suppression and prescribed fire operations.
- Maintain vegetation and fuel loading to support increased line production rates and decrease resistance to control of future wildland fires.
- Maintain snags in the area utilizing clumps where feasible located 200 feet from the top of the ridge.

FUELS REDUCTION ZONE

Fuels reduction zones are generally located adjacent to Strategic Management Zones as well as within identified SPLATS and previous fuels reduction projects. The purpose is to modify fire spread and intensity where fire modeling indicates a potential increase in fire spread within the area. The goal is to increase future fire resilience and allow for implementation of future fuels management projects; namely, prescribed fire and reforestation.

Fire Management Goals

- Strategically place fuels reduction zones where future treatments may create a pattern of treatments to modify the fire spread across the landscape and break the continuity of surface fuel loadings.
- Increase fire resilience within fuels reduction zones utilizing prescribed fire and other fuels management activities to reduce and maintain surface and canopy fuels to the level necessary to produce surface fire activity within treated stands.
- Utilize an integrated approach to develop fuel treatments which meet fire management goals while considering other ecosystem needs and processes.
- Utilize a collaborative approach to determine the density and location of snags within Fuels Reduction Zones.

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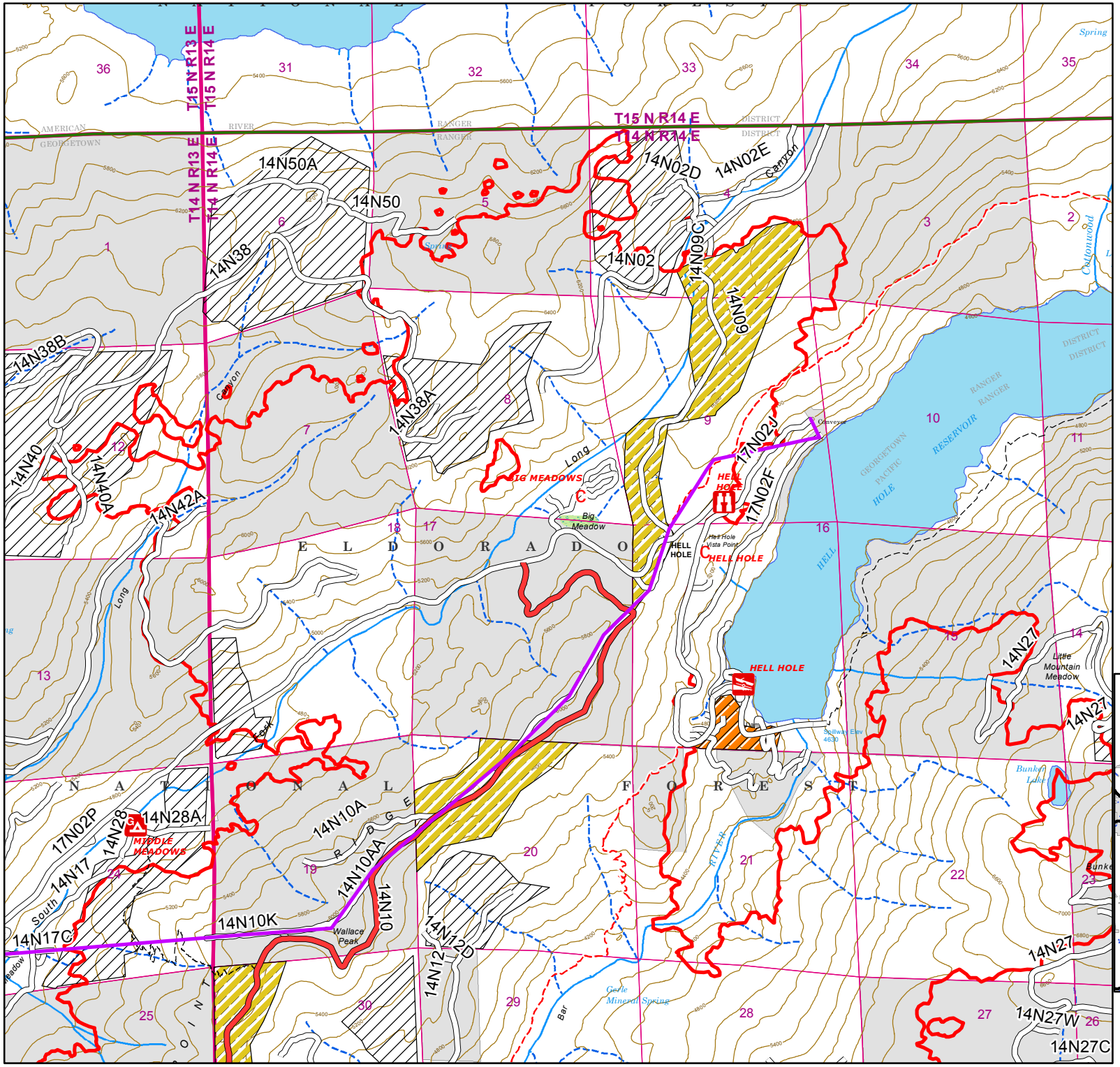
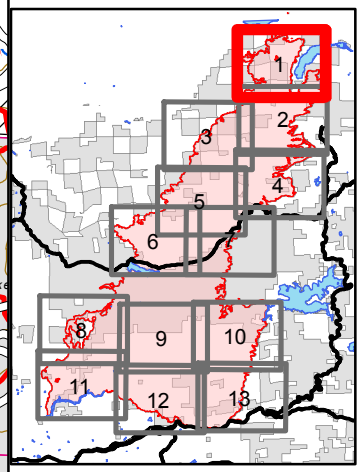
King Fire
Fire Mangement Strategy

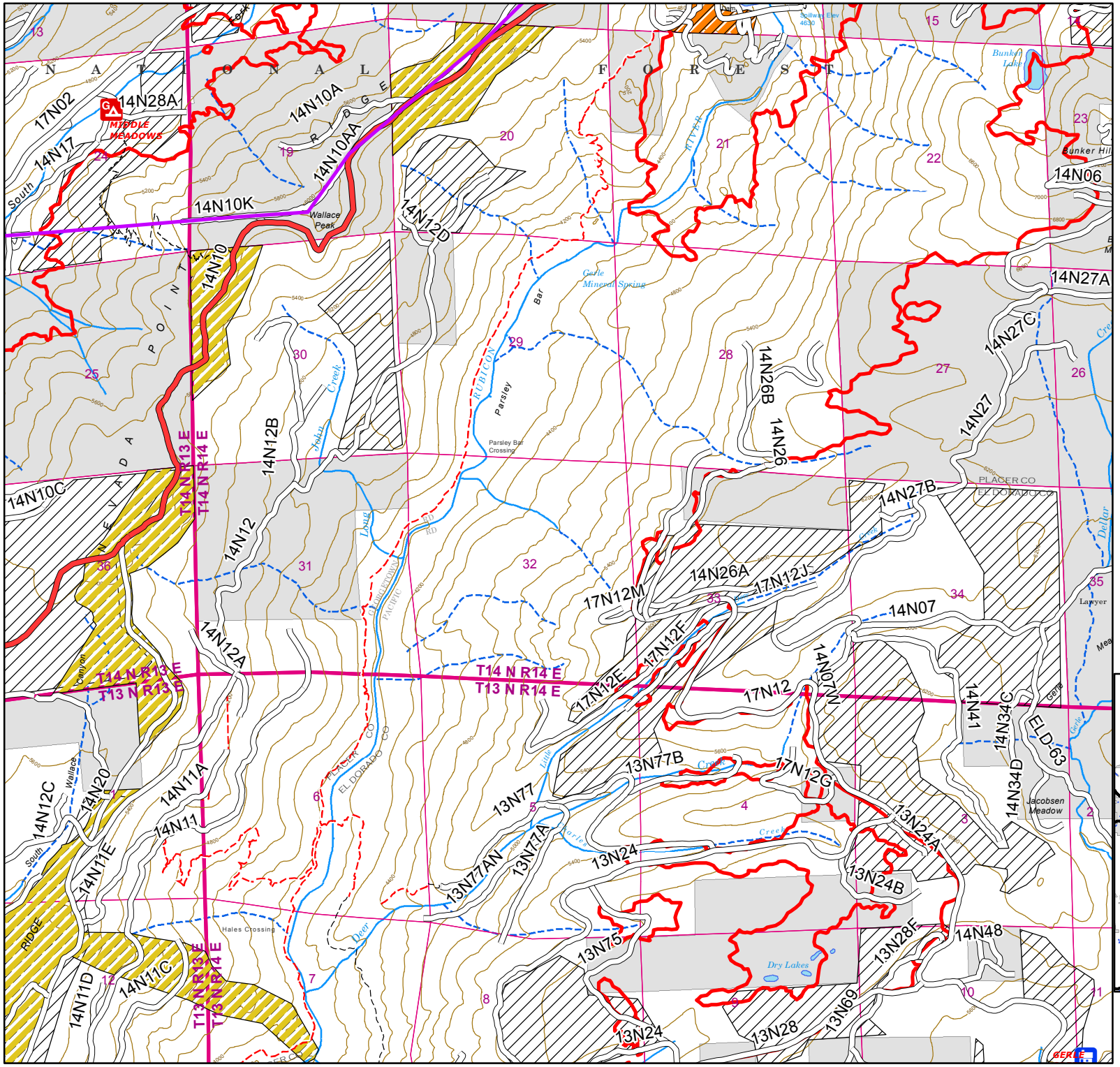


SFMZ

- SFMZ
- WUI
- SPLAT
- Power Lines



King Fire
Fire Mangement Strategy



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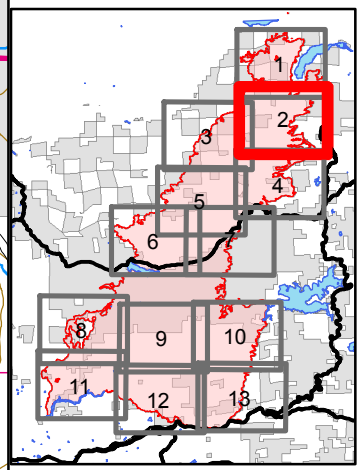
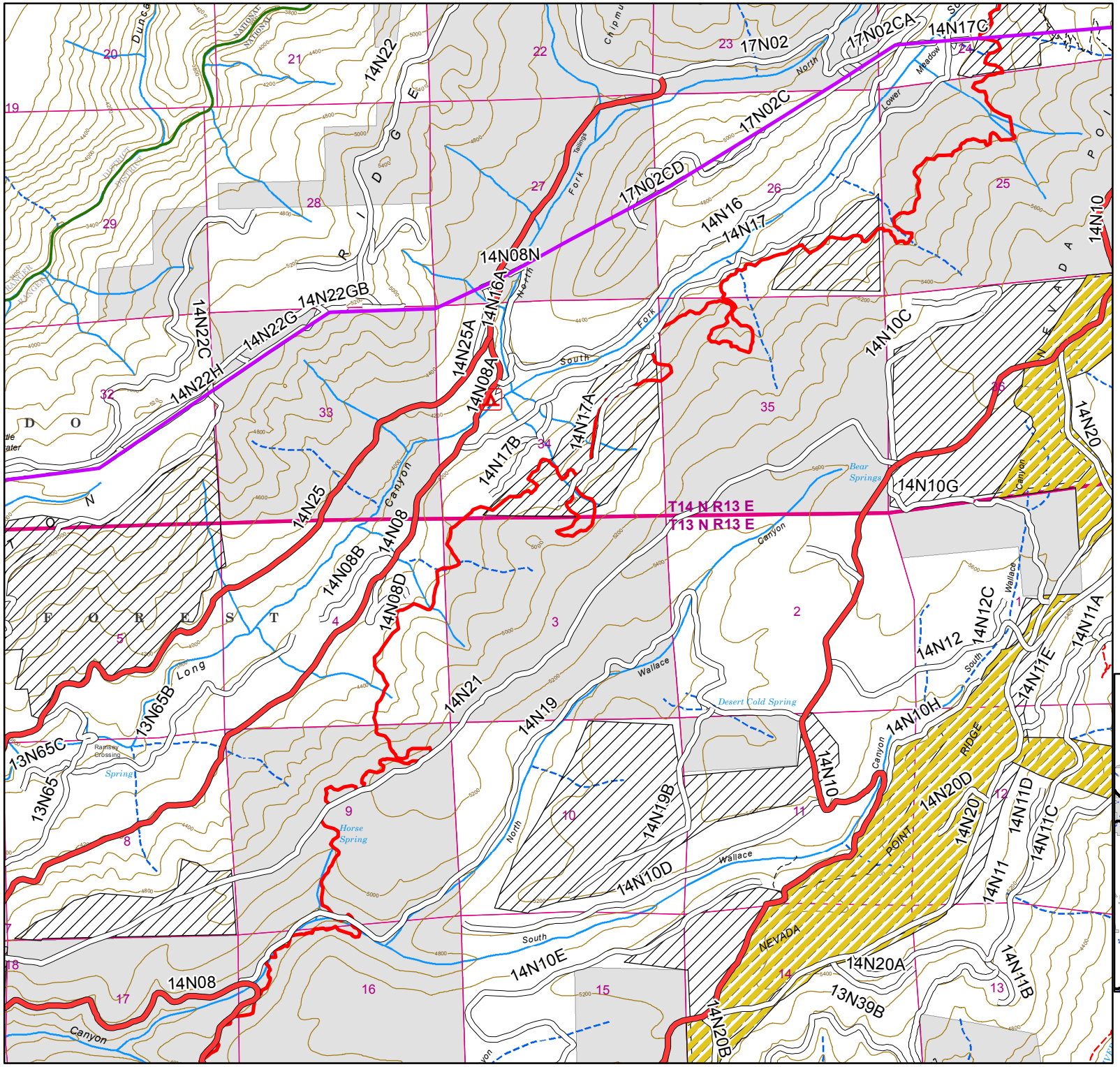


King Fire
Fire Mangement Strategy



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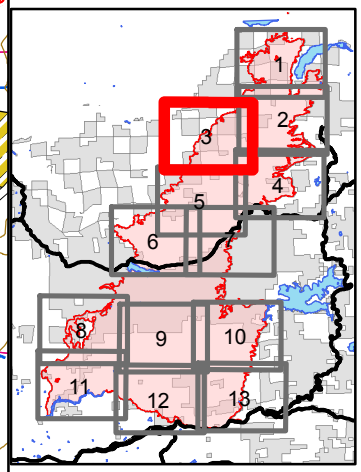
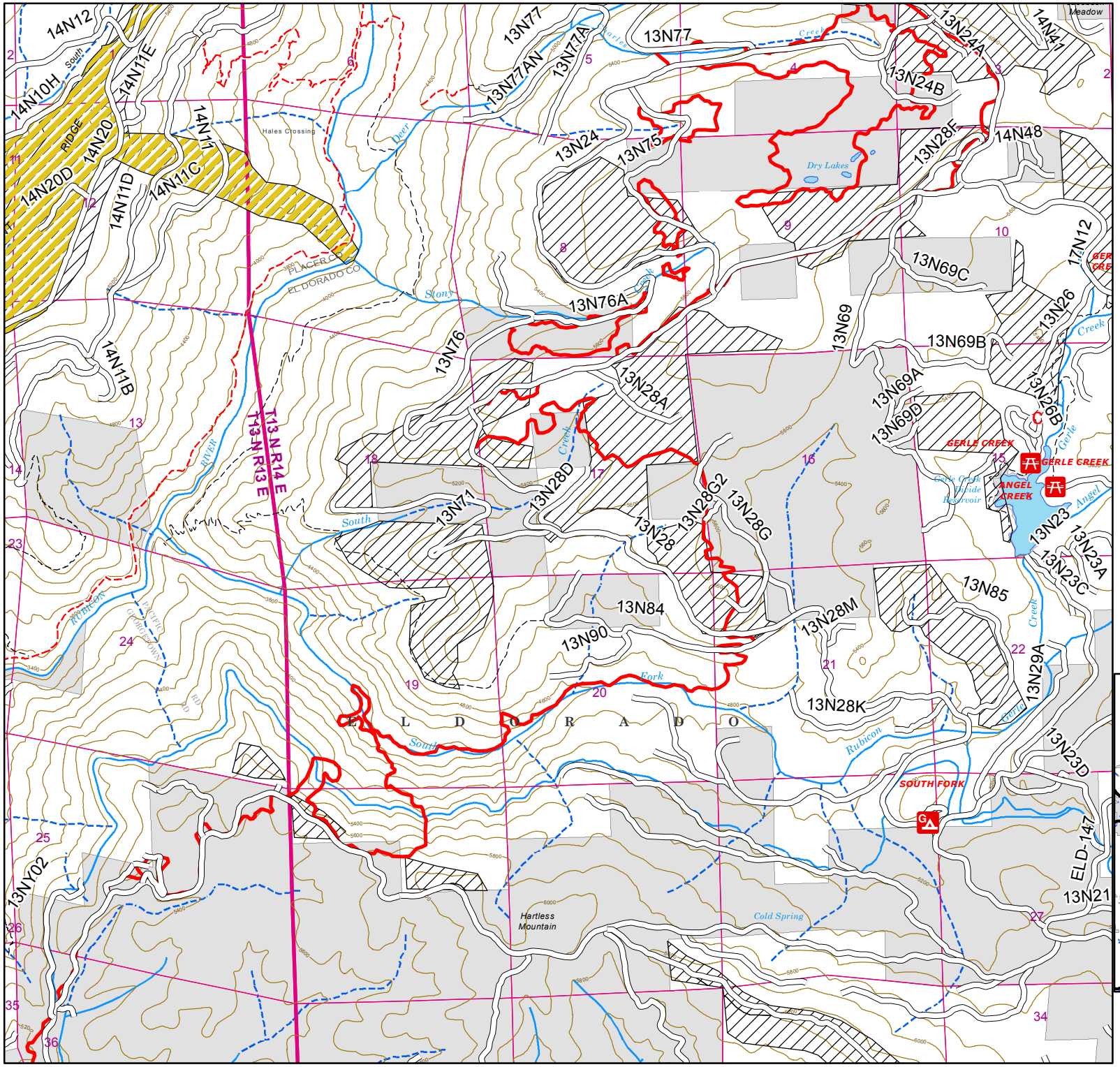


King Fire
Fire Mangement Strategy



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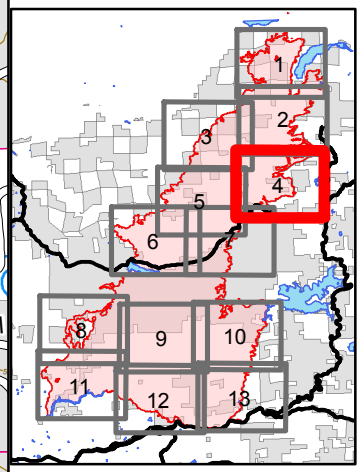
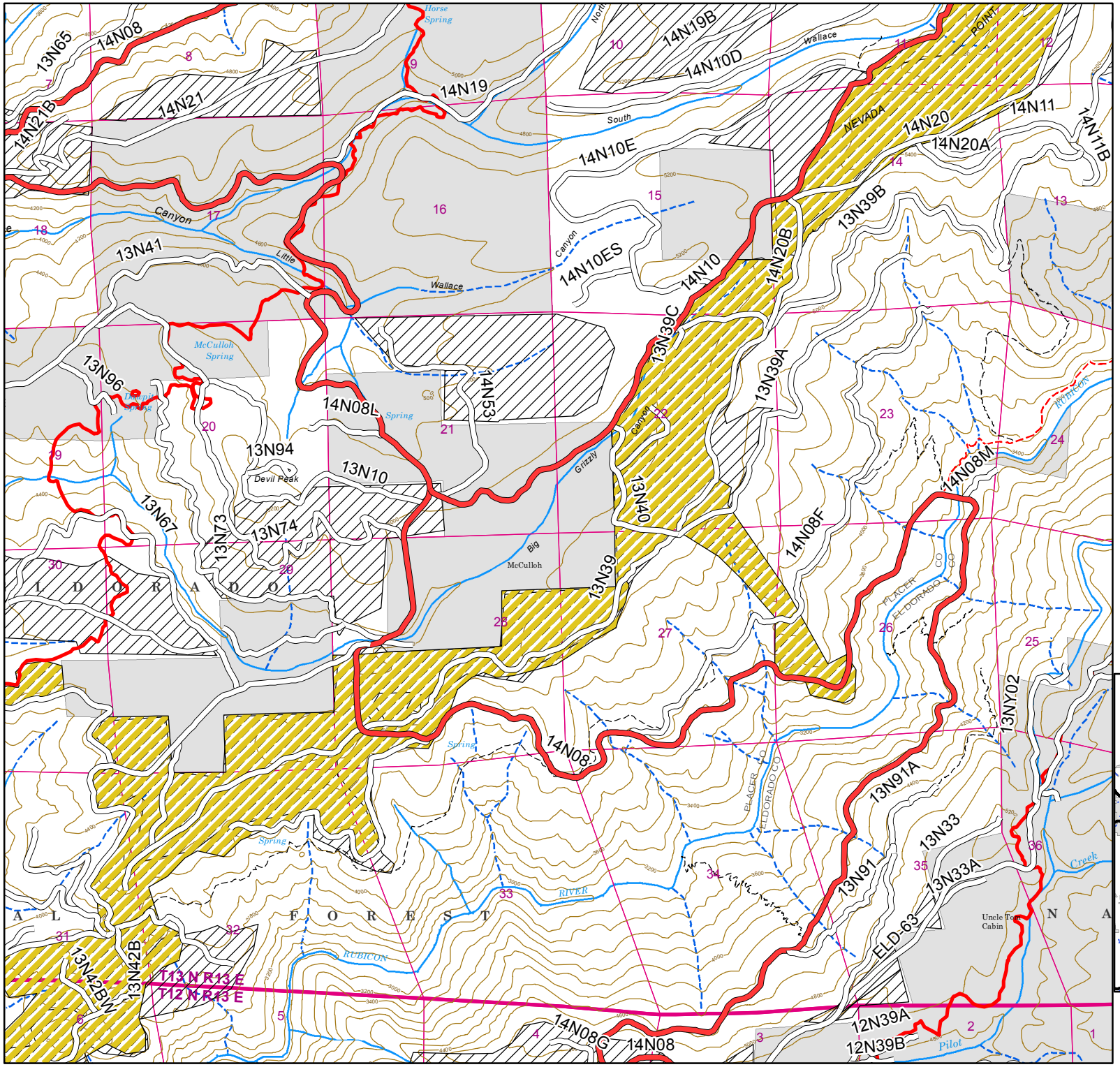


King Fire
Fire Mangement Strategy



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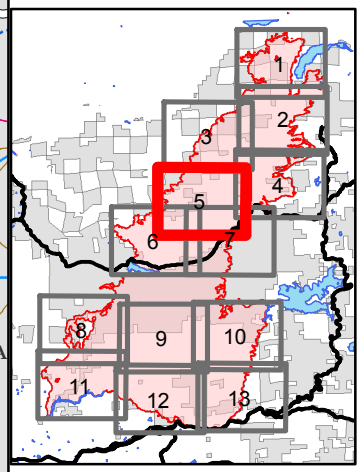
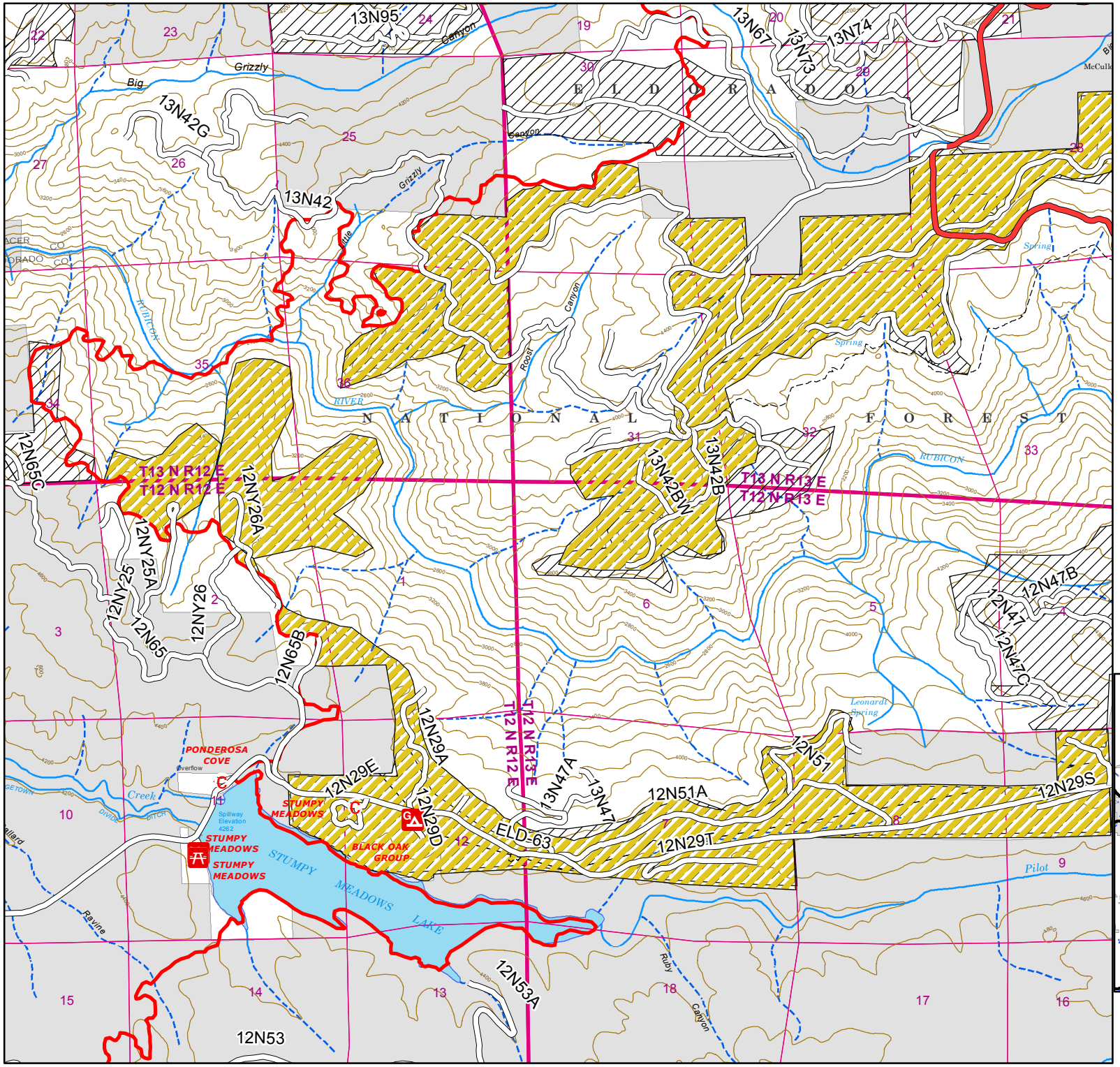


King Fire
Fire Mangement Strategy



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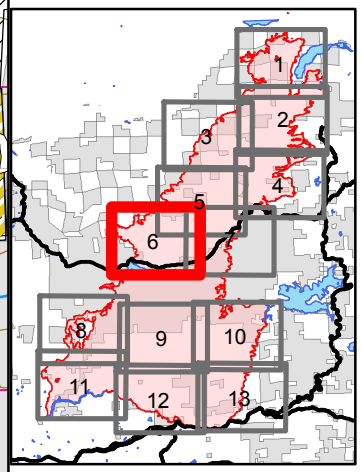
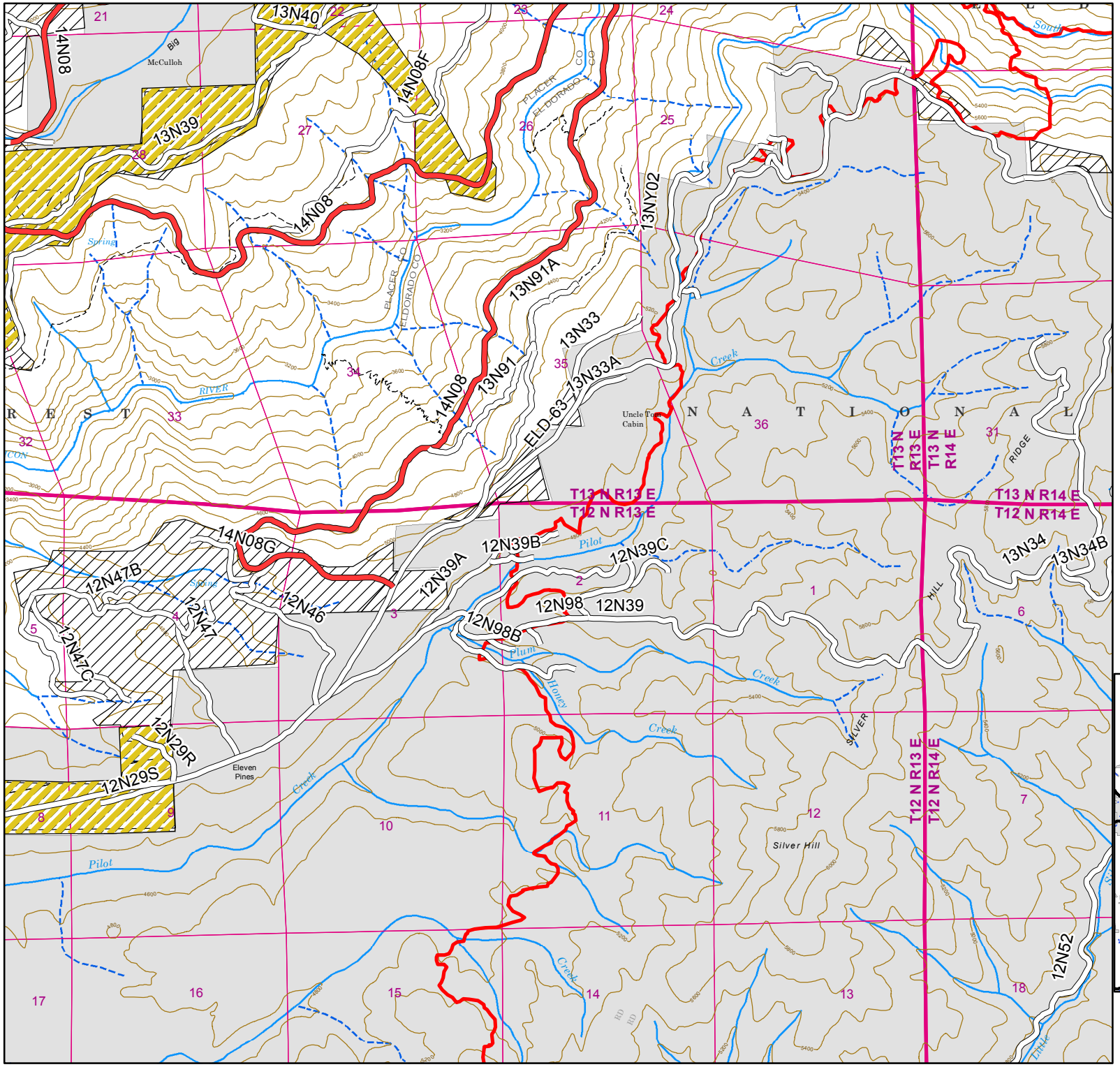


King Fire
Fire Mangement Strategy



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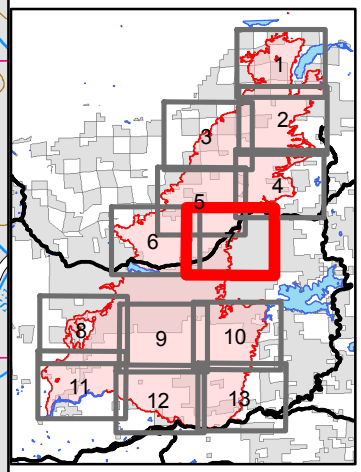
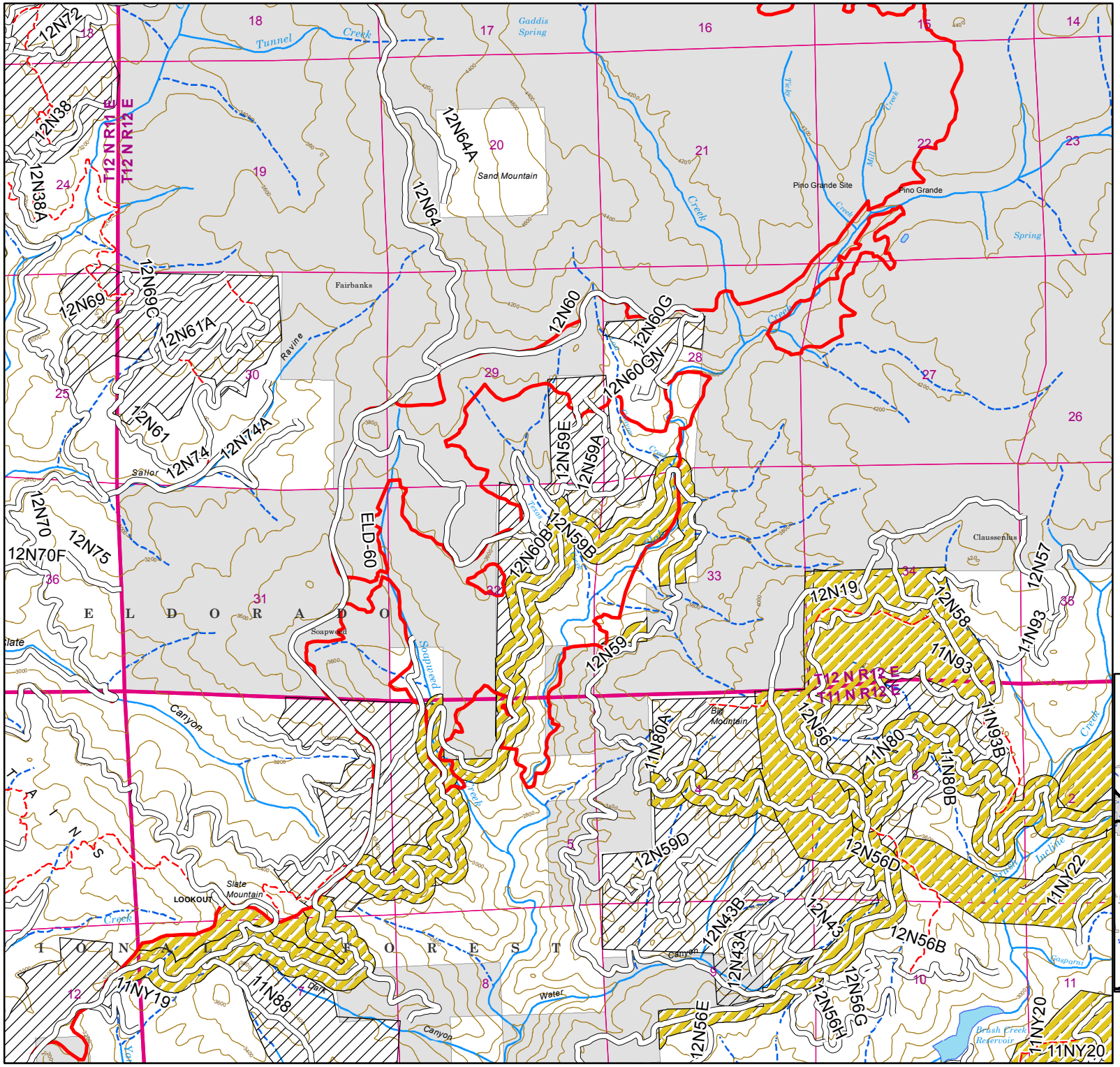


King Fire
Fire Mangement Strategy



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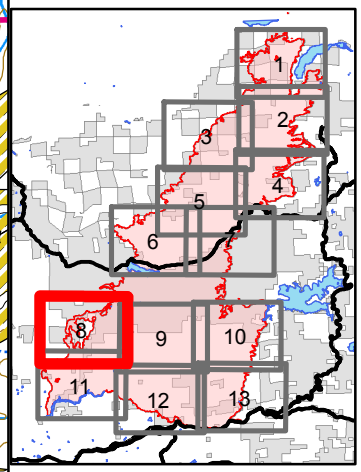
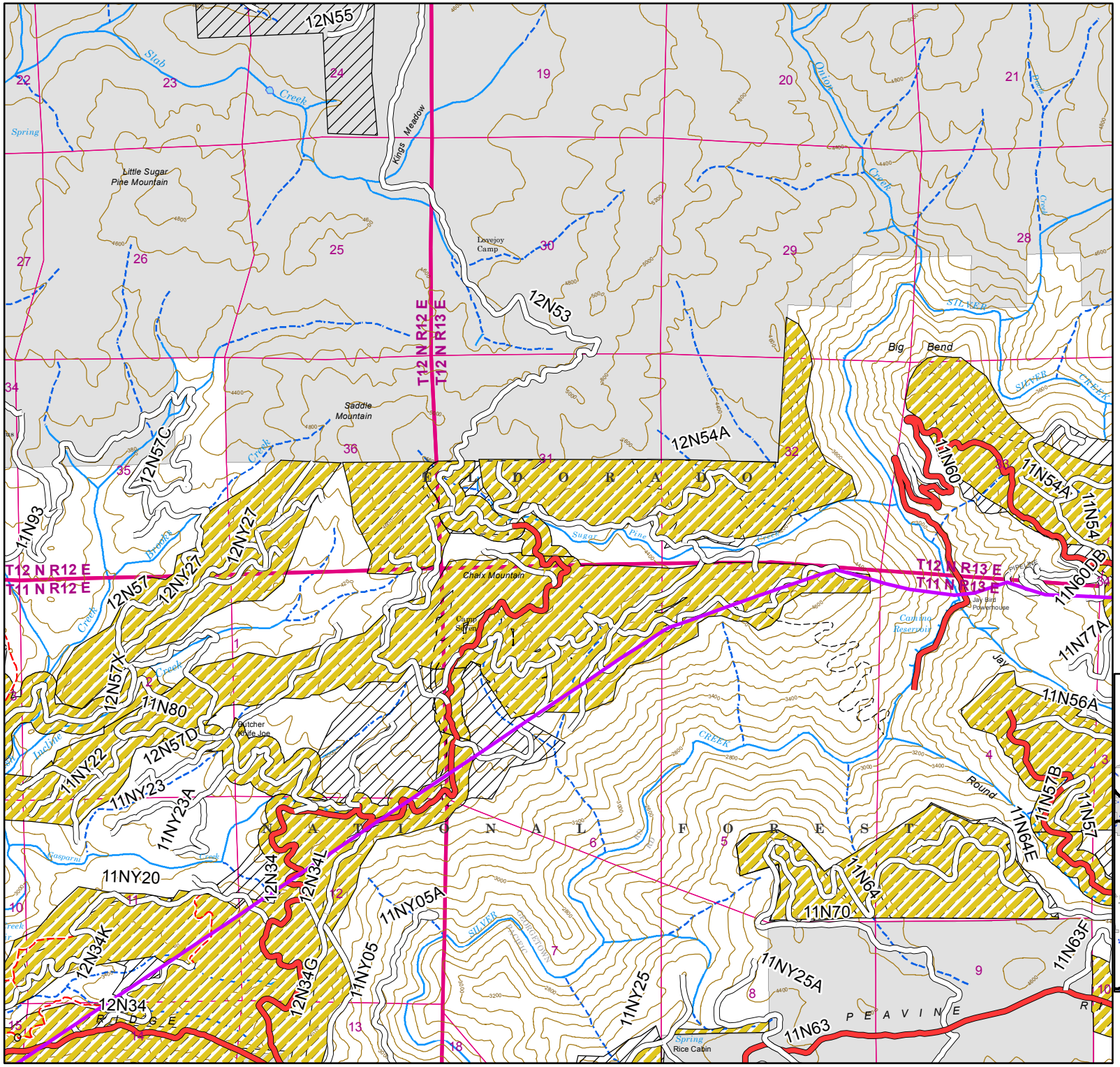


King Fire
Fire Mangement Strategy



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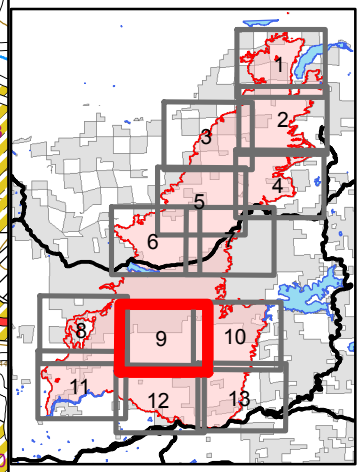
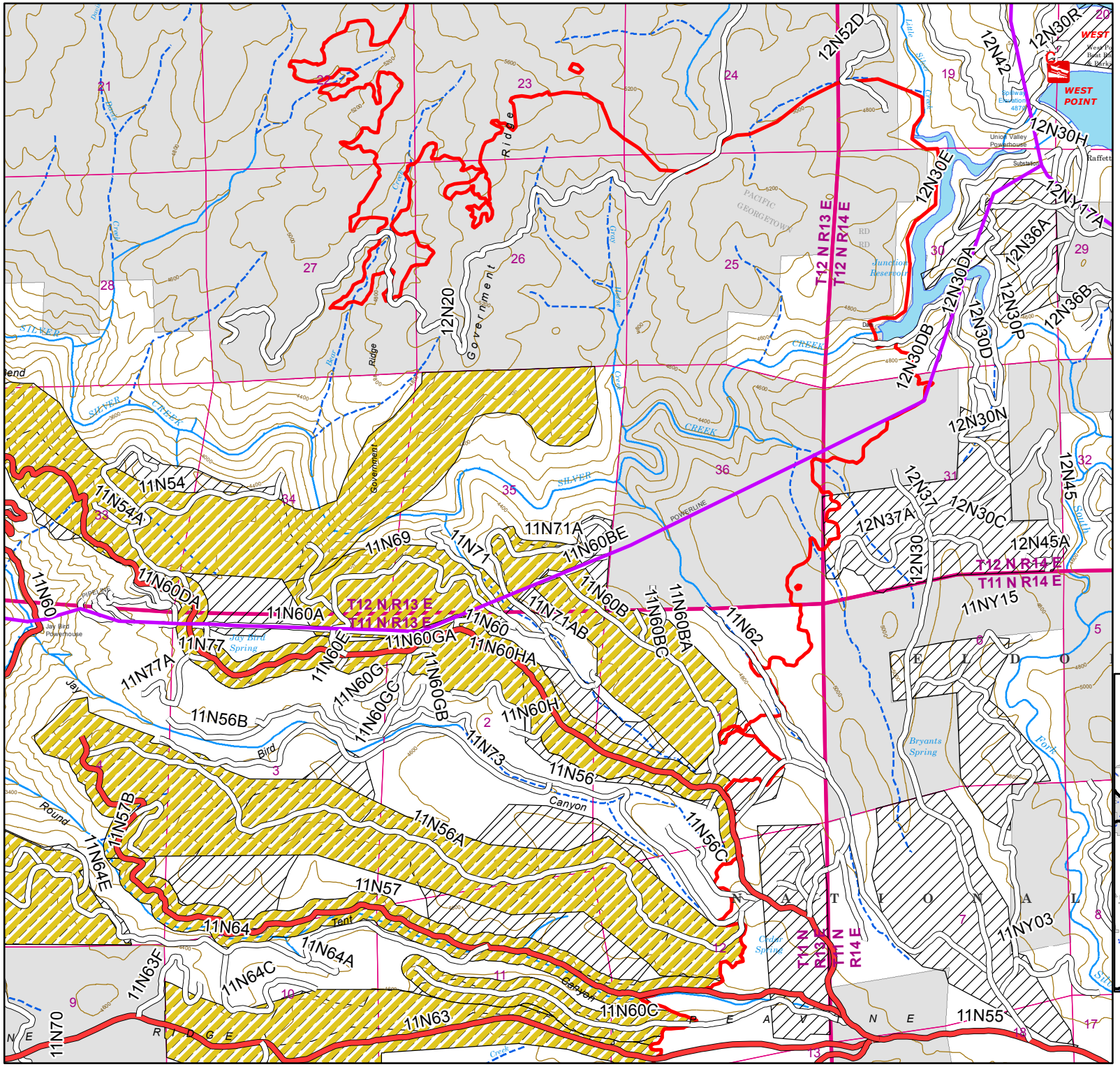


King Fire
Fire Mangement Strategy



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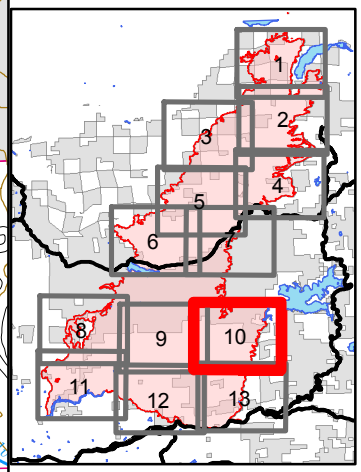
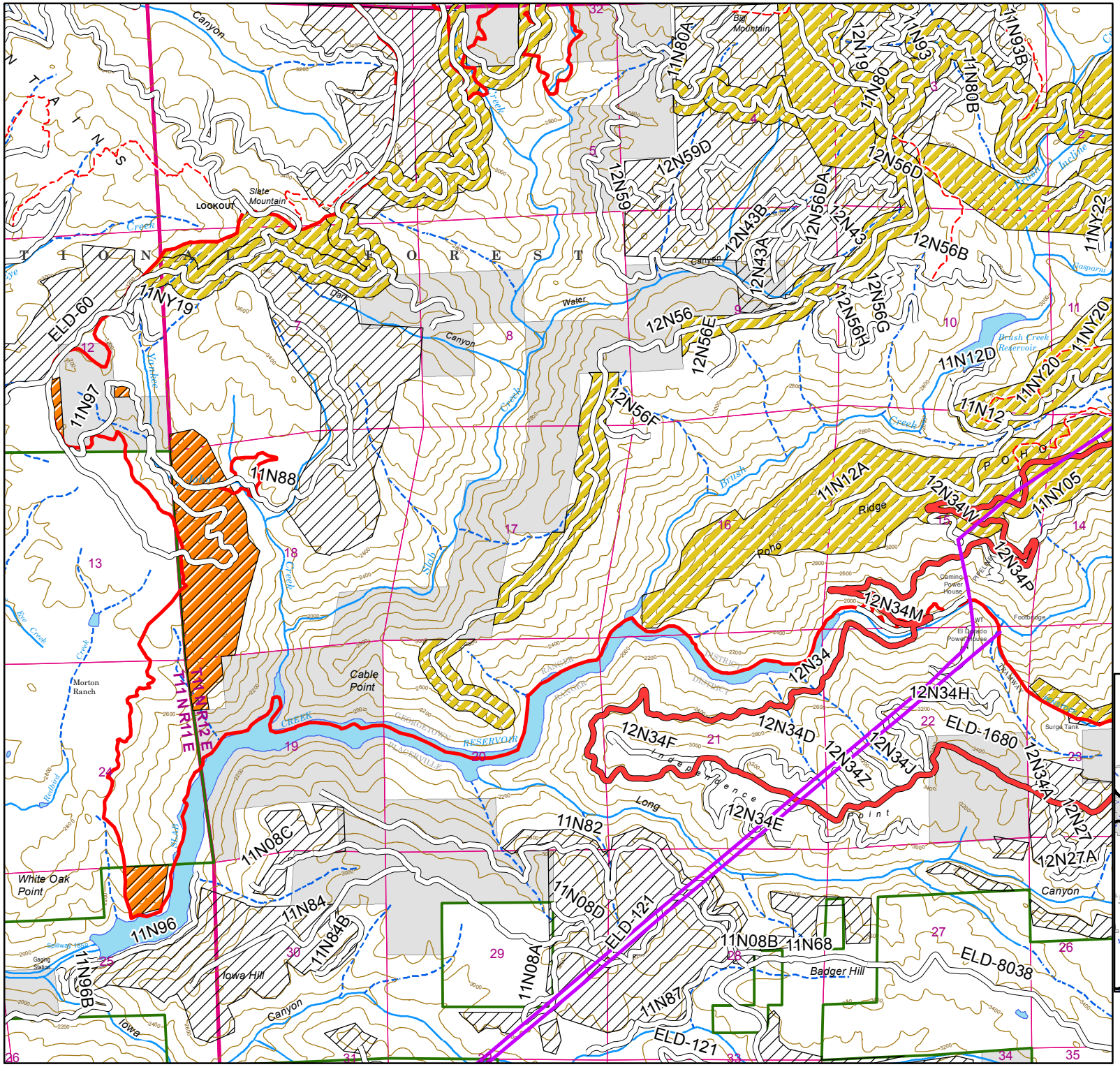


King Fire
Fire Mangement Strategy



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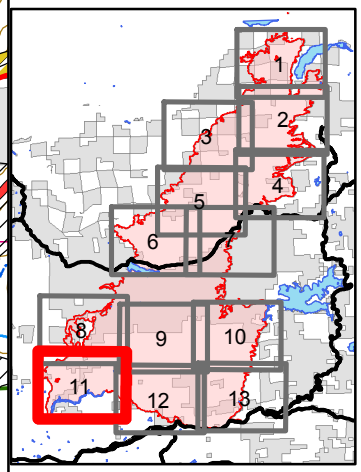
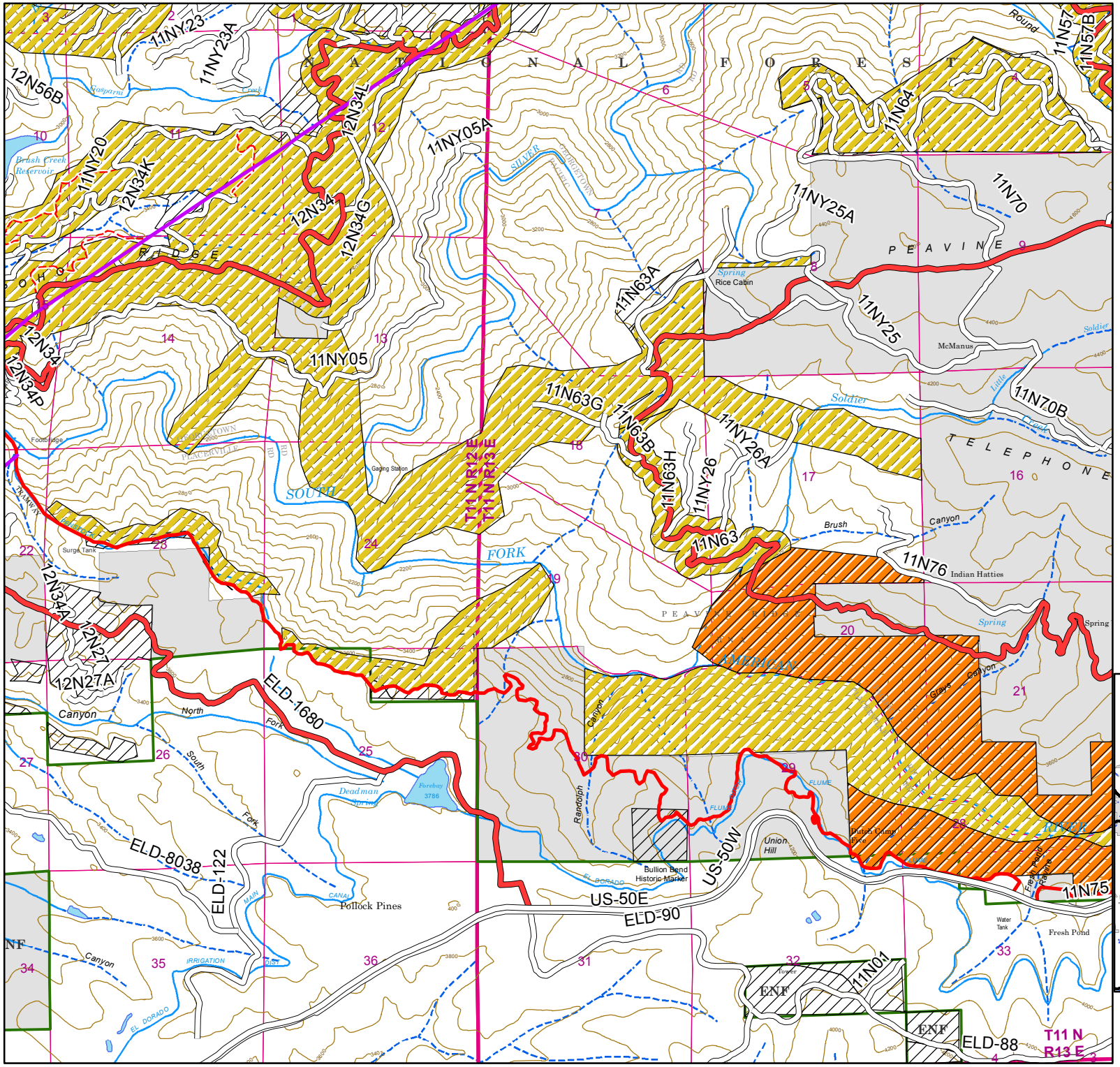


King Fire
Fire Mangement Strategy



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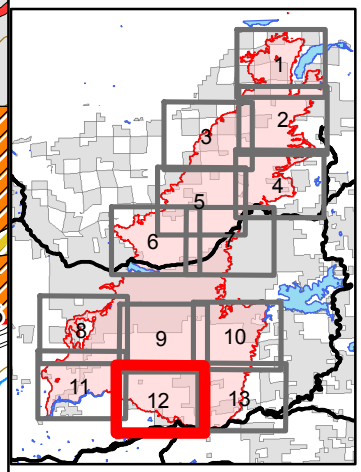
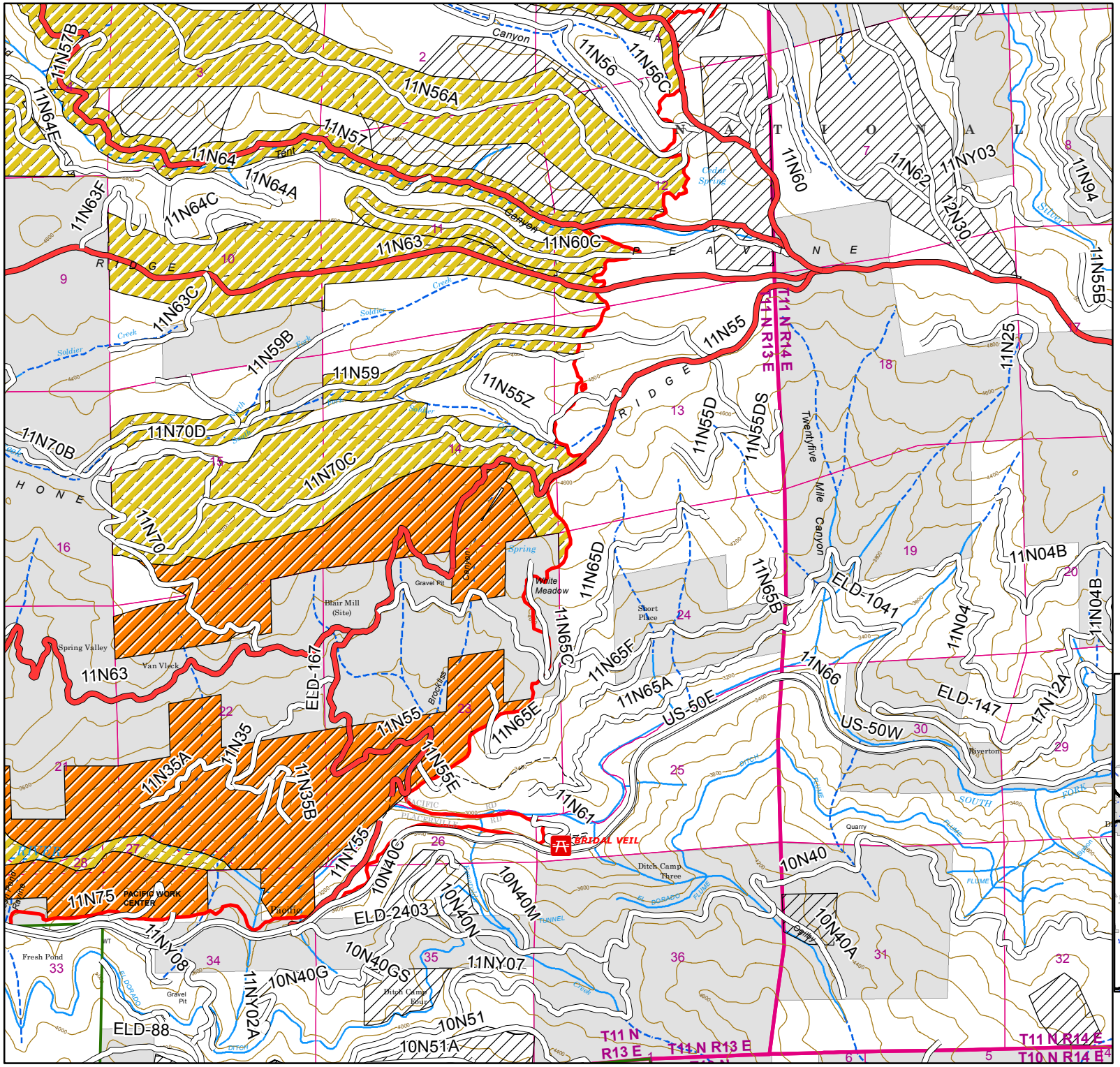


King Fire
Fire Mangement Strategy



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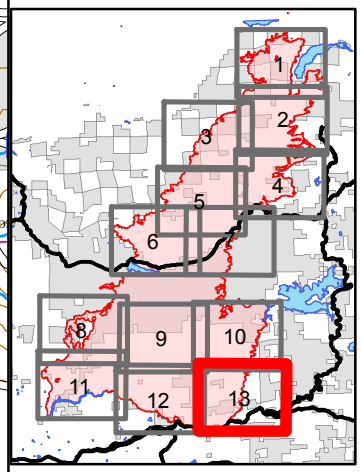


Appendix D: Road Repair and Maintenance

Maintenance Level	
1	BASIC CUSTODIAL CARE (CLOSED TO THE PUBLIC)
2	HIGH CLEARANCE VEHICLES
3	SUITABLE FOR PASSENGER CARS
4	MODERATE DEGREE OF USER COMFORT

RD_NO	NAME	MTCE. LEVEL	SURFACING	EST. MILES	TREATMENT
11N12	POHO RIDGE	2	P - PAVED	1.39	MAINTAIN
11N35	VLECK CREEK	2	NAT - NATIVE MATERIAL	0.55	MAINTAIN
11N57	ROUNDTENT CANYON	4	BST - BITUMINOUS SURFACE TREATMENT	4.14	MAINTAIN
11N57	ROUNDTENT CANYON	4	BST - BITUMINOUS SURFACE TREATMENT	0.63	MAINTAIN
11N59	SOLDIER CREEK	2	NAT - NATIVE MATERIAL	3.28	MAINTAIN
11N60	JAYBIRD SPRING	4	BST - BITUMINOUS SURFACE TREATMENT	4.75	MAINTAIN
11N60B	JAYBIRD NORTH	2	NAT - NATIVE MATERIAL	1.20	MAINTAIN
11N60C	TENT CANYON	1	NAT - NATIVE MATERIAL	2.18	MAINTAIN
11N63	WEST PEAVINE RIDGE	2	NAT - NATIVE MATERIAL	2.48	MAINTAIN
11N64	SPRING VALLEY	3	NAT - NATIVE MATERIAL	4.51	MAINTAIN
11N64C	SILVER TIP	2	NAT - NATIVE MATERIAL	0.84	MAINTAIN
11N70	MCMANUS	2	NAT - NATIVE MATERIAL	2.15	MAINTAIN
11N71	JAYBIRD CANYON SPRING	2	NAT - NATIVE MATERIAL	0.20	MAINTAIN
11N76	INDIAN HATTIES	2	NAT - NATIVE MATERIAL	0.64	MAINTAIN
11N78	N78	2	NAT - NATIVE MATERIAL	0.74	MAINTAIN
11N80	SOUTH BIG X	2	IMP - IMPROVED NATIVE MATERIAL	6.16	MAINTAIN
11N80A	OVER BIG X	2	NAT - NATIVE MATERIAL	0.66	MAINTAIN
11N93	WINDING WAY	1	NAT - NATIVE MATERIAL	0.91	MAINTAIN
11NY05	CROOKED SILVER	2	NAT - NATIVE MATERIAL	3.44	MAINTAIN
11NY20	GASPARNI	2	NAT - NATIVE MATERIAL	1.29	MAINTAIN
11NY20	GASPARNI	2	NAT - NATIVE MATERIAL	0.71	MAINTAIN
11NY22	X-RAY	1	NAT - NATIVE MATERIAL	0.46	MAINTAIN
11NY22A		1	NAT - NATIVE MATERIAL	0.32	MAINTAIN
12N19	CLAUSSENIUS	2	NAT - NATIVE MATERIAL	1.03	MAINTAIN
12N29E	STUMPY MEADOWS CAMPGROUND	3	AC - ASPHALT	0.50	MAINTAIN
12N34	FOREBAY	2	IMP - IMPROVED NATIVE MATERIAL	6.80	MAINTAIN
12N34	FOREBAY	3	BST - BITUMINOUS SURFACE TREATMENT	7.61	MAINTAIN
12N34K		2	NAT - NATIVE MATERIAL	1.40	MAINTAIN
12N34L	SADDLEBACK	2	NAT - NATIVE MATERIAL	0.85	MAINTAIN
12N43	WATER CANYON	2	NAT - NATIVE MATERIAL	1.08	MAINTAIN
12N43A	WATER CANYON #1	2	NAT - NATIVE MATERIAL	0.22	MAINTAIN
12N43B	WATER CANYON #2	2	NAT - NATIVE MATERIAL	0.28	MAINTAIN

RD_NO	NAME	MTCE. LEVEL	SURFACING	EST. MILES	TREATMENT
12N46	VAUGHN	2	NAT - NATIVE MATERIAL	0.58	MAINTAIN
12N47	ELEVEN PINES RIDGE	2	NAT - NATIVE MATERIAL	0.49	MAINTAIN
12N51	LEONARDI SPRINGS LOOP	2	NAT - NATIVE MATERIAL	1.39	MAINTAIN
12N51A	LENARD	2	NAT - NATIVE MATERIAL	1.23	MAINTAIN
12N53	KINGS MEADOW	2	NAT - NATIVE MATERIAL	0.72	MAINTAIN
12N53C	53CA	1	NAT - NATIVE MATERIAL	0.18	MAINTAIN
12N54	SUGAR PINE LOOP	2	NAT - NATIVE MATERIAL	3.16	MAINTAIN
12N54A	SUGAR WATER	1	NAT - NATIVE MATERIAL	0.71	MAINTAIN
12N54B	SUGAR PINE FLAT	1	NAT - NATIVE MATERIAL	0.11	MAINTAIN
12N54D	CROSSWIRE	1	NAT - NATIVE MATERIAL	0.44	MAINTAIN
12N54W	54W	1	NAT - NATIVE MATERIAL	0.04	MAINTAIN
12N56	BIG X MTN	2	NAT - NATIVE MATERIAL	2.70	MAINTAIN
12N57	BUTCHER KNIFE JOE	2	NAT - NATIVE MATERIAL	3.67	MAINTAIN
12N57F	BUTCHER JOE TIE THRU	1	NAT - NATIVE MATERIAL	0.25	MAINTAIN
12N57X	57X	2	NAT - NATIVE MATERIAL	0.21	MAINTAIN
12N58	CAMP SIX	2	NAT - NATIVE MATERIAL	0.52	MAINTAIN
12N59	SLAB CREEK	2	BST - BITUMINOUS SURFACE TREATMENT	5.09	MAINTAIN
12N64	SAND MOUNTAIN BLVD	4	BST - BITUMINOUS SURFACE TREATMENT	4.89	MAINTAIN
12NY23	HIGH TENSION SPUR	1	NAT - NATIVE MATERIAL	1.30	MAINTAIN
12NY27	SADDLE BRUSH	2	NAT - NATIVE MATERIAL	0.52	MAINTAIN
12NY27A	SIDE SADDLE	2	NAT - NATIVE MATERIAL	1.03	MAINTAIN
13N10	NEVADA POINT WEST	2	NAT - NATIVE MATERIAL	1.46	MAINTAIN
13N10	NEVADA POINT WEST	2	NAT - NATIVE MATERIAL	0.25	MAINTAIN
13N39	MCCULLOH RIDGE	2	NAT - NATIVE MATERIAL	3.66	MAINTAIN
13N39A	UPPER BELIX	2	NAT - NATIVE MATERIAL	0.85	MAINTAIN
13N39B	CLEAR CUT SPUR	2	NAT - NATIVE MATERIAL	0.25	MAINTAIN
13N40	ELLICOTT	2	NAT - NATIVE MATERIAL	0.25	MAINTAIN
13N42	UPPER ROOST CANYON	2	BST - BITUMINOUS SURFACE TREATMENT	1.45	MAINTAIN
13N42	UPPER ROOST CANYON	2	BST - BITUMINOUS SURFACE TREATMENT	1.16	MAINTAIN
13N67	BIG GRIZZLY CANYON	1	NAT - NATIVE MATERIAL	0.66	MAINTAIN
13N68	DEVIL GRIZZLY TIE	2	NAT - NATIVE MATERIAL	0.41	MAINTAIN
13N73	BIG GRIZZLY CAN NO SPUR	2	NAT - NATIVE MATERIAL	0.55	MAINTAIN
13N74	DEVIL PEAK	2	NAT - NATIVE MATERIAL	1.90	MAINTAIN
13N74	DEVIL PEAK	2	NAT - NATIVE MATERIAL	0.29	MAINTAIN
14N08	ELEVEN PINES	3	BST - BITUMINOUS SURFACE TREATMENT	20.90	MAINTAIN
14N08C	PIGEON FLAT	2	NAT - NATIVE MATERIAL	1.45	MAINTAIN
14N08E	BELIX SPRING	2	NAT - NATIVE MATERIAL	1.70	MAINTAIN
14N08F	BELIX TRAIL	1	NAT - NATIVE MATERIAL	1.21	MAINTAIN
14N08L	MCCULLOH PINES	1	NAT - NATIVE MATERIAL	0.38	MAINTAIN
14N10	NEVADA POINT RIDGE	2	BST - BITUMINOUS SURFACE TREATMENT	7.27	MAINTAIN
14N10C	NE BEAR SPRINGS	2	NAT - NATIVE MATERIAL	1.01	MAINTAIN
14N10E	EAST LITTLE WALLACE CAN	1	NAT - NATIVE MATERIAL	0.45	MAINTAIN
14N10G	WALLACE EAST	2	NAT - NATIVE MATERIAL	0.66	MAINTAIN

RD_NO	NAME	MTCE. LEVEL	SURFACING	EST. MILES	TREATMENT
14N11		1	NAT - NATIVE MATERIAL	3.57	MAINTAIN
14N11A	PARSLEY BAR	1	NAT - NATIVE MATERIAL	0.54	MAINTAIN
14N11D	NEVADA PARSLEY	1	NAT - NATIVE MATERIAL	0.22	MAINTAIN
14N11E	SLUMPY	1	NAT - NATIVE MATERIAL	0.64	MAINTAIN
14N12	LONG JOHN CREEK	2	NAT - NATIVE MATERIAL	2.00	MAINTAIN
14N12C	NORTH WALLACE	2	NAT - NATIVE MATERIAL	0.21	MAINTAIN
14N19	DESERT COLD SPRINGS	2	NAT - NATIVE MATERIAL	1.16	MAINTAIN
14N19	DESERT COLD SPRINGS	2	NAT - NATIVE MATERIAL	3.23	MAINTAIN
14N19B	DESERT COLD SPRING SOUTH	1	NAT - NATIVE MATERIAL	0.59	MAINTAIN
14N20	FALLION MILL	3	NAT - NATIVE MATERIAL	4.26	MAINTAIN
14N20B	NEVADA SPUR	2	NAT - NATIVE MATERIAL	0.69	MAINTAIN
14N20D		2	NAT - NATIVE MATERIAL	0.36	MAINTAIN
14N43	BIG MEADOW CG	3	BST - BITUMINOUS SURFACE TREATMENT	0.80	MAINTAIN
14N53	WALLACE CANYON	1	NAT - NATIVE MATERIAL	1.34	MAINTAIN
17N02	OLD ICE HOUSE	4	BST - BITUMINOUS SURFACE TREATMENT	7.82	MAINTAIN
SUBTOTAL MAINTENANCE				**168.88**	
11N12A	POHO HO	2	NAT - NATIVE MATERIAL	0.56	REPAIR
11N12A	POHO HO	2	NAT - NATIVE MATERIAL	0.26	REPAIR
11N35	VLECK CREEK	2	NAT - NATIVE MATERIAL	0.37	REPAIR
11N54	BEND	2	NAT - NATIVE MATERIAL	1.43	REPAIR
11N54A	BEND SPUR	2	NAT - NATIVE MATERIAL	0.21	REPAIR
11N54B	BEND OVER	2	NAT - NATIVE MATERIAL	0.63	REPAIR
11N55	PEAVINE RIDGE	2	NAT - NATIVE MATERIAL	1.22	REPAIR
11N55	PEAVINE RIDGE	2	NAT - NATIVE MATERIAL	2.76	REPAIR
11N55E	BROCK	2	NAT - NATIVE MATERIAL	0.18	REPAIR
11N56	JAYBIRD CANYON	2	NAT - NATIVE MATERIAL	1.16	REPAIR
11N56	JAYBIRD CANYON	2	NAT - NATIVE MATERIAL	1.96	REPAIR
11N56A	SIDE CANYON	1	NAT - NATIVE MATERIAL	3.83	REPAIR
11N57B	ROUND TUIT	1	NAT - NATIVE MATERIAL	0.28	REPAIR
11N60B	JAYBIRD NORTH	2	NAT - NATIVE MATERIAL	0.25	REPAIR
11N60BA	JAYBIRD NORTH 1	1	NAT - NATIVE MATERIAL	0.21	REPAIR
11N60BC	JAYBIRD NORTH 2	1	NAT - NATIVE MATERIAL	0.17	REPAIR
11N60BD		2	NAT - NATIVE MATERIAL	0.13	REPAIR
11N60BE		2	NAT - NATIVE MATERIAL	0.23	REPAIR
11N60D	JAYBIRD VALVE HOUSE	2	NAT - NATIVE MATERIAL	0.83	REPAIR
11N60DB		2	NAT - NATIVE MATERIAL	0.18	REPAIR
11N60DC	JAYBIRD VALVE HOUSE SPUR	2	NAT - NATIVE MATERIAL	0.38	REPAIR
11N60DD		2	NAT - NATIVE MATERIAL	0.04	REPAIR
11N60E	JADE EAST	1	NAT - NATIVE MATERIAL	0.08	REPAIR
11N60G	JAY GEE	1	NAT - NATIVE MATERIAL	0.64	REPAIR
11N60GA	JAY GEE A	1	NAT - NATIVE MATERIAL	0.10	REPAIR
11N60H	JAYBIRD H	1	NAT - NATIVE MATERIAL	0.27	REPAIR
11N60HA	JAYBIRD HA	1	NAT - NATIVE MATERIAL	0.57	REPAIR
11N63	WEST PEAVINE RIDGE	2	NAT - NATIVE MATERIAL	10.18	REPAIR
11N63A	SPRING VALLEY	2	NAT - NATIVE MATERIAL	0.70	REPAIR

RD_NO	NAME	MTCE. LEVEL	SURFACING	EST. MILES	TREATMENT
11N63C	NORTH ALLEN	1	NAT - NATIVE MATERIAL	0.27	REPAIR
11N63F	SILVER PEA	2	NAT - NATIVE MATERIAL	0.63	REPAIR
11N64E	ROUND TENT SPUR	2	NAT - NATIVE MATERIAL	0.18	REPAIR
11N64F	ROUND TENT WEST	1	NAT - NATIVE MATERIAL	0.41	REPAIR
11N69	POWERLINE RIM	2	NAT - NATIVE MATERIAL	1.53	REPAIR
11N69A	POWERLINE RIM SPUR	2	NAT - NATIVE MATERIAL	0.52	REPAIR
11N70C	TELEPHONE EAST	2	NAT - NATIVE MATERIAL	2.53	REPAIR
11N70D	TELEPHONE SPUR	1	NAT - NATIVE MATERIAL	0.84	REPAIR
11N71	JAYBIRD CANYON SPRING	2	NAT - NATIVE MATERIAL	0.87	REPAIR
11N71A	SILVER CANYON VISTA	2	NAT - NATIVE MATERIAL	1.61	REPAIR
11N71B	SILVER CANYON EAST	2	NAT - NATIVE MATERIAL	0.44	REPAIR
11N72A	BACKHAUL SPUR	2	NAT - NATIVE MATERIAL	0.31	REPAIR
11N73	JAYBIRD SOUTH	2	NAT - NATIVE MATERIAL	2.22	REPAIR
11N76	INDIAN HATTIES	2	NAT - NATIVE MATERIAL	0.47	REPAIR
11N76	INDIAN HATTIES	2	NAT - NATIVE MATERIAL	0.22	REPAIR
11N77	JAYBIRD SPRING WEST	2	NAT - NATIVE MATERIAL	0.10	REPAIR
11N77A	JAYBIRD SPRING SOUTH	2	NAT - NATIVE MATERIAL	0.51	REPAIR
11N93	WINDING WAY	1	NAT - NATIVE MATERIAL	0.72	REPAIR
11NY20	GASPARNI	2	NAT - NATIVE MATERIAL	0.36	REPAIR
11NY22	X-RAY	1	NAT - NATIVE MATERIAL	0.13	REPAIR
11NY22AB		1	NAT - NATIVE MATERIAL	0.08	REPAIR
11NY25	RICE MCMANUS TIE	2	NAT - NATIVE MATERIAL	0.39	REPAIR
11NY25A	RICE RIDGE	2	NAT - NATIVE MATERIAL	1.08	REPAIR
12N19		2	NAT - NATIVE MATERIAL	1.07	REPAIR
12N29R	PITCH PINE	1	NAT - NATIVE MATERIAL	0.33	REPAIR
12N34G	FOREBAY SPUR	2	NAT - NATIVE MATERIAL	1.23	REPAIR
12N34KB		1	NAT - NATIVE MATERIAL	0.16	REPAIR
12N34P	34P	1	NAT - NATIVE MATERIAL	0.17	REPAIR
12N46	VAUGHN	2	NAT - NATIVE MATERIAL	0.44	REPAIR
12N47	ELEVEN PINES RIDGE	2	NAT - NATIVE MATERIAL	1.80	REPAIR
12N47A	DIGGER PINE	2	NAT - NATIVE MATERIAL	0.35	REPAIR
12N47B	JACK PINE	2	NAT - NATIVE MATERIAL	0.23	REPAIR
12N47C	JEFFREY PINE	1	NAT - NATIVE MATERIAL	0.49	REPAIR
12N53CA	53CA	1	NAT - NATIVE MATERIAL	0.36	REPAIR
12N54DA	54DA	2	NAT - NATIVE MATERIAL	0.16	REPAIR
12N54E	54E	1	NAT - NATIVE MATERIAL	0.37	REPAIR
12N56	BIG X MTN	2	NAT - NATIVE MATERIAL	3.46	REPAIR
12N56	BIG X MTN	2	NAT - NATIVE MATERIAL	0.31	REPAIR
12N56E	MANZANITA	2	NAT - NATIVE MATERIAL	0.33	REPAIR
12N56F	DUG FIR	2	NAT - NATIVE MATERIAL	0.43	REPAIR
12N57E	57E	2	NAT - NATIVE MATERIAL	0.39	REPAIR
12N58	CAMP SIX	2	NAT - NATIVE MATERIAL	0.31	REPAIR
13E05		1	NAT - NATIVE MATERIAL	0.38	REPAIR
13N39A	UPPER BELIX	2	NAT - NATIVE MATERIAL	1.14	REPAIR
13N39B	CLEAR CUT SPUR	2	NAT - NATIVE MATERIAL	1.41	REPAIR
13N40	ELLICOTT	2	NAT - NATIVE MATERIAL	0.59	REPAIR
13N42	UPPER ROOST CANYON	2	NAT - NATIVE MATERIAL	2.63	REPAIR

RD_NO	NAME	MTCE. LEVEL	SURFACING	EST. MILES	TREATMENT
13N42C	LITTLE PIGEON	1	NAT - NATIVE MATERIAL	0.30	REPAIR
13N42D	ROOST CANYON	2	NAT - NATIVE MATERIAL	0.83	REPAIR
13N42E	INDIAN ROCK	2	NAT - NATIVE MATERIAL	0.76	REPAIR
13N42H	ROOST SPUR	2	NAT - NATIVE MATERIAL	0.50	REPAIR
13N47	BACCHI RANCH BYPASS	1	NAT - NATIVE MATERIAL	0.60	REPAIR
13N73	BIG GRIZZLY CAN NO SPUR	2	NAT - NATIVE MATERIAL	0.93	REPAIR
13N73A	GRIZZLY TERRACE	1	NAT - NATIVE MATERIAL	0.70	REPAIR
13N91	MID SLOPE	2	NAT - NATIVE MATERIAL	0.89	REPAIR
13N91	MID SLOPE	2	NAT - NATIVE MATERIAL	0.83	REPAIR
13N91A	SET UP	2	NAT - NATIVE MATERIAL	0.43	REPAIR
13N94	DEVIL TOP	1	NAT - NATIVE MATERIAL	0.14	REPAIR
14N08D	LAZY J SPUR	2	NAT - NATIVE MATERIAL	0.54	REPAIR
14N08F	BELIX TRAIL	1	NAT - NATIVE MATERIAL	0.76	REPAIR
14N08G	VAUGHN CABIN	2	NAT - NATIVE MATERIAL	0.59	REPAIR
14N08M	RUBI	2	NAT - NATIVE MATERIAL	0.23	REPAIR
14N09	CHIPMUNK RIDGE	4	BST - BITUMINOUS SURFACE TREATMENT	2.26	REPAIR
14N10	NEVADA POINT RIDGE	2	NAT - NATIVE MATERIAL	1.64	REPAIR
14N10	NEVADA POINT RIDGE	2	NAT - NATIVE MATERIAL	1.84	REPAIR
14N10C	NE BEAR SPRINGS	2	NAT - NATIVE MATERIAL	0.57	REPAIR
14N10E	EAST LITTLE WALLACE CAN	1	NAT - NATIVE MATERIAL	2.11	REPAIR
14N10H	CANYON WALLACE	1	NAT - NATIVE MATERIAL	0.78	REPAIR
14N11	PARSLEY BAR	1	NAT - NATIVE MATERIAL	0.30	REPAIR
14N11B	HALES CROSSING	2	NAT - NATIVE MATERIAL	0.30	REPAIR
14N12	LONG JOHN CREEK	2	NAT - NATIVE MATERIAL	1.98	REPAIR
14N12	LONG JOHN CREEK	2	NAT - NATIVE MATERIAL	1.42	REPAIR
14N12A	LONG JOHNS	1	NAT - NATIVE MATERIAL	0.32	REPAIR
14N12B	LONG JOHN SPUR	1	NAT - NATIVE MATERIAL	0.52	REPAIR
14N17	SOUTH LOWER MEADOWS	2	NAT - NATIVE MATERIAL	1.12	REPAIR
14N17A	GRANITE TUNNEL EAST	2	NAT - NATIVE MATERIAL	1.00	REPAIR
14N20A	FALLION SPUR	2	NAT - NATIVE MATERIAL	0.49	REPAIR
14N20C		2	NAT - NATIVE MATERIAL	0.13	REPAIR
14N53A		1	NAT - NATIVE MATERIAL	0.19	REPAIR
17N02G		2	NAT - NATIVE MATERIAL	0.36	REPAIR
NS-1		1	NAT - NATIVE MATERIAL	0.18	REPAIR
SUBTOTAL REPAIR				**91.33**	
TOTAL MILES OF ROADS				**259.57**	

APPENDIX D: UNIT TREATMENTS

TABLE LEGEND

Conifer Resilience	CR	Plant/Release	P/Rel
Strategic Fire Management Zone	SFMZ	Release of Planted Seedlings	Rel
Wildland Urban Intermix	WUI	Hand Thin and Hand Pile Small Material	HT/HP
Roadside	RD	Watershed Improvement Treatments	WS
Strategically Placed Landscape Treatment	SPLAT	Natural Recovery	NRec
Forest Resilience with Variable Snag Retention Study	VSS	Natural Regeneration	NReg
Variable SAL and Planting Study and WSA	Var/PL	SFMZ Reforestation	SFMZ/Ref
Watershed Sensitive Area	WSA	Mid to Upper Slope Reforestation Area	M-U/Ref
Resource Benefit	RB	Upper Slope Reforestation Area	U/Ref
Long Term Soil Productivity Study	LTSP	Mid to Lower Slope Reforestation Area	M-L/Ref
Control for Monitoring by the Regional Water Board	CVRWB	Lower Slope Reforestation Area	L/Ref
Prescribe Fire	PF	Mid Slope Reforestation Area	M/Ref
Roadside Salvage	RDSAL	Upper Slope Hardwood/Pine Reforestation Area	UHW/P/Ref
Mechanical Harvest	MH	Glyphosate or Hand Grub	Gly/HG
Hazard Tree Felling and Hand Piling of Small Material	HZ/HP	Survey 1st	SURV
Skyline Harvest	SH	Hardwood/Pine	HW/P
Masticate or Pile	M/P	Post Monitoring Gly/HG	Mon Gly/HG

Unit Number	Mgmt Zone	Special Treatment Designs	Initial Treatment	Reforestation Strategy		Release Methods	ALT. 2 and 5 (acres)	ALT. 3 (acres)	ALT. 4 (acres)
0	Other		PF	NRec		PF	2,058	2,085	1,997
0	RD		RDSAL	NRec		PF	-	-	67
1	CR		MH	M-U/Ref		Gly/HG	214	214	214
2	CR		MH	U/Ref	SURV	Gly/HG	67	-	67
3	CR	CR with VSS	MH	M-U/Ref		Gly/HG	355	355	355
4	CR	WSA	MH	M-U/Ref		Gly/HG	5	5	5
5	SFMZ		MH	SFMZ/Ref		Gly/HG	21	21	21
21	Other	RB	HZ/HP	NRec		None	6	6	5
21	RD		RDSAL	NRec		None	-	-	1
22	Other	RB	HZ/HP	NRec		None	7	7	6
22	RD		RDSAL	NRec		None	-	-	1
23	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	29	-	29
24	CR		MH	M-L/Ref		Gly/HG	4	4	4
24	CR		SH	M-L/Ref		Gly/HG	13	12	13

Unit Number	Mgmt Zone	Special Treatment Designs	Initial Treatment	Reforestation Strategy		Release Methods	ALT. 2 and 5 (acres)	ALT. 3 (acres)	ALT. 4 (acres)
25	SFMZ		MH	NReg		None	39	21	39
26	SFMZ		MH	NReg		None	6	4	6
27	WSA	WSA	MH	NRec		None	5	5	5
28	WSA	WSA	MH	NRec		None	5	5	5
30	WSA	WSA	MH	NRec		None	7	7	7
33	CR		MH	M-L/Ref	SURV	Gly/HG	30	-	30
34	CR		MH	M-L/Ref	SURV	Gly/HG	85	-	85
35	CR		MH	M-L/Ref	SURV	Gly/HG	42	-	42
37	CR		SH	Upper to L/Ref		Gly/HG	85	85	85
40	SFMZ		MH	SFMZ/Ref		Gly/HG	9	9	9
42	CR		MH	L/Ref		Gly/HG	3	3	3
43	CR		MH	M-L/Ref		Gly/HG	14	14	14
44	SFMZ		MH	NReg		None	69	43	69
45	CR		MH	M/Ref	SURV	Gly/HG	48	-	48
46	SFMZ		MH	NReg		None	41	31	41
47	SFMZ		MH	NReg		Gly/HG	82	51	82
48	SFMZ		MH	NReg		None	18	7	18
49	SFMZ		MH	NReg		None	78	20	78
50	SFMZ		MH	SFMZ/Ref		Gly/HG	157	112	157
51	CR		MH	M/Ref		Gly/HG	9	9	9
52	CR		MH	M-L/Ref		Gly/HG	35	35	35
53	SFMZ		MH	SFMZ/Ref		Gly/HG	5	5	5
54	SFMZ		MH	SFMZ/Ref		Gly/HG	5	2	5
55	SFMZ		MH	SFMZ/Ref		Gly/HG	3	2	3
56	SFMZ		MH	SFMZ/Ref		Gly/HG	14	14	14
57	SFMZ		MH	SFMZ/Ref		Gly/HG	1	1	1
58	SFMZ		MH	SFMZ/Ref		Gly/HG	14	13	14
61	SFMZ	RB	HZ/HP	NRec		None	6	-	6
62	Other	RB	HZ/HP	NRec		None	3	-	2
62	RD		RDSAL	NRec		None	-	-	1
63	SFMZ	RB	HZ/HP	NRec		None	6	-	4
65	Other	RB	HZ/HP	NRec		None	2	-	1
65	RD		RDSAL				-	-	1
66	SFMZ	RB	HZ/HP	NRec		None	6	6	2
66	RD		RDSAL	NRec		None	-	-	4
67	Other	RB	HZ/HP	NRec		None	3	-	3
70	SFMZ	RB	HZ/HP	NRec		None	2	2	2
71	Other	RB	HZ/HP	NRec		None	3	-	-
71	RD		RDSAL	NRec		None	-	-	3

Unit Number	Mgmt Zone	Special Treatment Designs	Initial Treatment	Reforestation Strategy		Release Methods	ALT. 2 and 5 (acres)	ALT. 3 (acres)	ALT. 4 (acres)
72	Other	RB	HZ/HP	NRec		None	3	-	1
72	Other		RDSAL	NRec		None	-	-	2
73	Other	RB	HZ/HP	NRec		None	3	-	3
74	Other	RB	HZ/HP	NRec		None	2	-	1
74	RD		RDSAL	NRec		None	-	-	1
75	Other	RB	HZ/HP	NRec		None	2	-	1
75	RD		RDSAL	NRec		None	-	-	1
81	CR		SH	NReg		None	34	34	57
82	SFMZ		MH	NReg		None	12	12	12
83	SFMZ		MH	NReg		None	29	29	29
100	SFMZ		MH	SFMZ/Ref		Gly/HG	85	85	85
101	CR		MH	M/Ref		Gly/HG	180	180	180
104	SFMZ		MH	NReg		PF	18	18	18
200	CR		MH	M/Ref		Gly/HG	118	118	118
201	SFMZ		MH	SFMZ/Ref		Gly/HG	41	41	41
202	SFMZ		MH	SFMZ/Ref		Gly/HG	24	24	24
203	CR	CR with VSS	MH	M/Ref		Gly/HG	239	239	239
204	CR	CR with VSS	MH	M/Ref		Gly/HG	105	105	105
205	SFMZ		MH	SFMZ/Ref		Gly/HG	371	371	371
206	CR		MH	M-L/Ref		Gly/HG and BF	51	51	39
206	RD		RDSAL	M-L/Ref		Gly/HG and BF	-	-	12
207	CR		MH	U/Ref		Gly/HG and BF	6	6	3
207	RD		RDSAL	U/Ref		Gly/HG and BF	-	-	3
208	CR		SH	U/Ref		Gly/HG and BF	22	22	18
208	RD		RDSAL	U/Ref		Gly/HG and BF	-	-	4
301	CR		MH	M/Ref		Gly/HG	194	-	194
302	CR		MH	M/Ref		Gly/HG	27	27	27
303	CR		MH	NReg		Gly/HG	15	15	15
304	CR	WSA	MH	M-L/Ref		Gly/HG	42	42	42
306	CR	Var/PL	MH	M/Ref		Gly/HG	130	130	130
307	CR		MH	M/Ref		Gly/HG	20	20	20
308	CR	CR with VSS	MH	M/Ref		Gly/HG	101	101	101
309	CR		MH	M/Ref		Gly/HG	107	-	107
310	CR	Var/PL	MH	M/Ref		Gly/HG	111	111	111
311	CR		MH	M/Ref		Gly/HG	4	-	4

Unit Number	Mgmt Zone	Special Treatment Designs	Initial Treatment	Reforestation Strategy		Release Methods	ALT. 2 and 5 (acres)	ALT. 3 (acres)	ALT. 4 (acres)
312	SFMZ		MH	SFMZ/Ref		Gly/HG	111	111	111
313	CR		M/P	M/Ref		Gly/HG	3	3	3
314	SFMZ		M/P	SFMZ/Ref		Gly/HG	7	7	7
315	SFMZ		M/P	SFMZ/Ref		Gly/HG	4	4	4
316	SFMZ		M/P	SFMZ/Ref		Gly/HG	3	3	3
317	SFMZ		MH	SFMZ/Ref		Gly/HG	18	18	18
318	SFMZ		MH	SFMZ/Ref		Gly/HG	12	12	12
319	SFMZ		M/P	SFMZ/Ref		Gly/HG	3	3	3
320	SFMZ		MH	SFMZ/Ref		Gly/HG	18	18	18
321	SFMZ		MH	SFMZ/Ref		Gly/HG	6	6	6
323	SFMZ		MH	SFMZ/Ref		Gly/HG	59	59	59
324	CR		M/P	M/Ref		Gly/HG	2	324	2
325	SFMZ		MH	SFMZ/Ref		Gly/HG	11	11	11
326	SFMZ		MH	SFMZ/Ref		Gly/HG and BF	36	36	21
327	SFMZ		MH	SFMZ/Ref		Gly/HG and BF	18	18	18
330	HW/P		MH	UHW/P/Ref		Gly/HG	43	43	43
331	HW/P		MH	UHW/P/Ref		Gly/HG	20	20	20
332	SFMZ		MH	SFMZ/Ref		Gly/HG	69	69	69
333	SFMZ		MH	SFMZ/Ref		Gly/HG	107	107	107
403	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	21	21	21
404	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	4	4	4
450	CR		MH	U/Ref		Gly/HG	19	19	19
451	CR		MH	U/Ref		Gly/HG	19	19	19
452	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	16	15	16
453	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	15	14	15
501	SFMZ		P/Rel	SFMZ/Ref		Gly/HG	7	7	7
502	CR		P/Rel	M/Ref		Gly/HG	5	5	5
503	SFMZ	WSA	MH	SFMZ/Ref		Gly/HG	63	63	63
504	SFMZ	WSA	P/Rel	SFMZ/Ref		Gly/HG	39	39	39
509	CR		Rel	M/Ref		Gly/HG	14	14	14
510	CR	CR with VSS	MH	M/Ref		Gly/HG	97	97	97
511	CR		SH	M-L/Ref		Gly/HG	67	-	67
512	CR		MH	M/Ref		Gly/HG	14	14	14
514	CR		MH	M/Ref		Gly/HG	8	8	8
515	CR	Var/PL WSA	MH	M/Ref		Gly/HG	271	271	271
516	CR	LTSP	Rel	8x8		Gly/HG	10	10	10
518	SFMZ		MH	SFMZ/Ref		Gly/HG	161	161	161
522	CR		MH	L/Ref		Gly/HG	4	4	4

Unit Number	Mgmt Zone	Special Treatment Designs	Initial Treatment	Reforestation Strategy		Release Methods	ALT. 2 and 5 (acres)	ALT. 3 (acres)	ALT. 4 (acres)
523	CR		MH	M-L/Ref		Gly/HG	13	13	13
524	CR		MH	M/Ref		Gly/HG	3	3	3
525	CR		MH	M/Ref		Gly/HG	24	24	24
526	CR		MH	M-L/Ref		Gly/HG	11	11	11
527	CR		MH	M/Ref		Gly/HG	7	7	7
528	CR	LTSP	Rel	8x8		Gly/HG	8	8	8
529	CR	LTSP	Rel	8x8		Gly/HG	9	9	9
530	CR		MH	M/Ref		Gly/HG	9	9	9
531	CR		MH	M/Ref		Gly/HG	11	11	11
532	CR	Var/PL	MH	M-L/Ref	SURV	Gly/HG	57	57	57
533	CR		MH	M/Ref		Gly/HG	3	-	3
535	CR		MH	M/Ref		Gly/HG	12	12	12
537	CR		MH	M/Ref		Gly/HG	29	29	29
539	SFMZ	WSA	MH	SFMZ/Ref		Gly/HG	44	31	44
540	CR	CR with VSS	MH	M-U/Ref	SURV	Gly/HG	96	96	96
541	CR	WSA	MH	M-U/Ref		Gly/HG	20	20	20
542	SFMZ		MH	SFMZ/Ref		Gly/HG	2	2	2
543	CR		MH	U/Ref		Gly/HG	2	2	2
547	SFMZ	Var/PL	MH	SFMZ/Ref		Gly/HG	49	49	49
554	CR		MH	M/Ref		Gly/HG	6	6	6
555	CR		MH	M/Ref		Gly/HG	4	4	4
556	CR	WSA	MH	M-L/Ref		Gly/HG	24	23	24
557	CR		MH	M/Ref		Gly/HG	24	24	24
559	CR	WSA	MH	M/Ref		Gly/HG	9	9	9
561	CR	CR with VSS	MH	M-U/Ref	SURV	Gly/HG	40	40	40
562	CR	CR with VSS	MH	M/Ref		Gly/HG	44	44	44
563	CR	CR with VSS	MH	M-L/Ref	SURV	Gly/HG	62	62	62
654	CR		MH	M-L/Ref	SURV	Gly/HG	7	7	7
565	CR		MH	M/Ref		Gly/HG	28	28	28
566	CR	WSA	MH	Upper to L/Ref		Gly/HG	73	73	73
567	CR	WSA	MH	M/Ref		Gly/HG	18	18	18
568	CR	Var/PL WSA	MH	M-U/Ref		Gly/HG	77	77	77
601	SFMZ	WSA	MH	SFMZ/Ref	SURV	Gly/HG	18	18	18
603	SFMZ	WSA	WS	SFMZ/Ref	SURV	Gly/HG	16	16	16
606	Other	RB	HZ/HP	NRec		None	103	103	103
607	CR		M/P	M/Ref		Gly/HG	22	22	22
608	CR		M/P	M-U/Ref		Gly/HG	16	16	16

Unit Number	Mgmt Zone	Special Treatment Designs	Initial Treatment	Reforestation Strategy		Release Methods	ALT. 2 and 5 (acres)	ALT. 3 (acres)	ALT. 4 (acres)
609	CR		M/P	M-U/Ref		Gly/HG	6	6	6
610	CR		M/P	M/Ref		Gly/HG	10	10	10
611	CR		MH	M-U/Ref		Gly/HG	17	17	17
612	CR		M/P	M/Ref		Gly/HG	25	25	25
613	CR		MH	M/Ref		Gly/HG	4	4	4
614	CR		M/P	M/Ref		Gly/HG	7	7	7
615	SFMZ		MH	SFMZ/Ref		Gly/HG	22	22	22
616	CR		P/Rel	M/Ref		Gly/HG	5	5	5
617	SFMZ		M/P	SFMZ/Ref		Gly/HG	18	18	18
618	SFMZ		MH	SFMZ/Ref		Gly/HG	17	17	17
619	SFMZ		MH	SFMZ/Ref		Gly/HG	14	14	14
620	SFMZ		P/Rel	SFMZ/Ref		Gly/HG	2	2	2
621	SFMZ		P/Rel	SFMZ/Ref		Gly/HG	10	10	10
622	SFMZ		MH	SFMZ/Ref		Gly/HG	3	3	3
623	CR		P/Rel	M/Ref		Gly/HG	9	9	9
624	SFMZ		P/Rel	SFMZ/Ref		Gly/HG	3	3	3
625	CR		MH	M/Ref		Gly/HG	6	-	6
626	CR	WSA	MH	M-U/Ref		Gly/HG and BF	89	89	77
626	RD		RDSAL	M-U/Ref		Gly/HG and BF	-	-	12
627	CR		M/P	M-U/Ref		Gly/HG and BF	5	5	5
629	CR	WSA	P/Rel	M-U/Ref		Gly/HG	5	5	5
630	CR		M/P	M-U/Ref		Gly/HG	10	10	10
631	CR	WSA	MH	M-U/Ref		Gly/HG	33	17	33
632	CR		MH	M-U/Ref		Gly/HG	36	-	36
633	CR		Rel	M-U/Ref		Gly/HG and BF	188	188	170
633	CR		RDSAL	M-U/Ref		Gly/HG	-	-	11
634	SFMZ		MH	SFMZ/Ref		Gly/HG	16	16	16
635	CR		P/Rel	M/Ref		Gly/HG	7	7	7
636	CR		P/Rel	M/Ref		Gly/HG	11	11	11
637	CR		P/Rel	M/Ref		Gly/HG	13	13	13
640	SFMZ		M/P	SFMZ/Ref		Gly/HG	2	2	2
641	CR		M/P	M/Ref		Gly/HG and BF	6	6	6
642	CR		P/Rel	M/Ref		Gly/HG	14	14	14
643	CR		P/Rel	M/Ref		Gly/HG	18	18	18
644	CR		P/Rel	M/Ref		Gly/HG	25	25	25
645	SFMZ		M/P	SFMZ/Ref		Gly/HG	4	4	4
646	CR		M/P	M/Ref		Gly/HG	10	10	10

Unit Number	Mgmt Zone	Special Treatment Designs	Initial Treatment	Reforestation Strategy		Release Methods	ALT. 2 and 5 (acres)	ALT. 3 (acres)	ALT. 4 (acres)
647	CR		M/P	M/Ref		Gly/HG	10	10	10
648	CR		M/P	M/Ref		Gly/HG	4	4	4
649	SFMZ		P/Rel	SFMZ/Ref		Gly/HG	19	19	19
651	CR		M/P	M-L/Ref		Gly/HG	8	8	8
652	CR		M/P	M-L/Ref		Gly/HG and BF	11	11	11
653	CR		M/P	M-L/Ref		Gly/HG and BF	4	4	4
654	CR		M/P	M-U/Ref		Gly/HG and BF	16	15	16
657	CR		M/P	M-U/Ref		Gly/HG and BF	5	5	5
660	SFMZ		HT/HP	NRec		PF	114	116	114
661	Other		HZ/HP	NRec		PF	1	1	1
662	SFMZ		SH	SFMZ/Ref		Gly/HG and BF	8	8	8
663	CR		MH	M/Ref		Gly/HG and BF	38	38	38
665	SFMZ		HT/HP	SFMZ/Ref		Gly/HG and BF	44	44	37
665	SFMZ		RDSAL	SFMZ/Ref		Gly/HG and BF	-	-	7
666	SFMZ		MH	SFMZ/Ref		Gly/HG and BF	71	71	71
667	Other		MH	NReg		PF	28	-	26
667	RD		RDSAL	NReg		PF	-	-	2
668	SFMZ	WSA	MH	SFMZ/Ref		Gly/HG	191	191	191
669	SFMZ		MH	SFMZ/Ref		Gly/HG	101	101	101
673	SFMZ		P/Rel	SFMZ/Ref		Gly/HG	19	19	19
674	SFMZ		HT/HP	NRec		PF	15	15	15
675	SFMZ		MH	NReg		PF	304	303	256
676	CR	WSA	MH	M/Ref		Hand Grub	16	16	16
677		WSA	WS	NRec		None	35	35	35
679	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	161	147	161
680	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	43	34	43
681	CR		MH	Upper to L/Ref		Gly/HG	415	249	415
682	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	7	4	7
683	SFMZ		MH	SFMZ/Ref		Gly/HG	27	1	27
684	SFMZ		MH	SFMZ/Ref		Gly/HG	8	8	8
685	SFMZ		MH	SFMZ/Ref		Gly/HG	84	56	84
687	SFMZ		MH	SFMZ/Ref		Gly/HG	32	32	32
688	SFMZ		MH	SFMZ/Ref		Gly/HG	9	1	9
689	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	32	32	32
690	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	8	2	8

Unit Number	Mgmt Zone	Special Treatment Designs	Initial Treatment	Reforestation Strategy		Release Methods	ALT. 2 and 5 (acres)	ALT. 3 (acres)	ALT. 4 (acres)
692	SFMZ		MH	NReg		None	8	3	8
693	SFMZ		MH	SFMZ/Ref		Gly/HG	2	2	2
694	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	8	8	8
695	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	21	20	21
696	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	7	-	7
697	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	2	2	2
699	CR		MH	M/Ref		Gly/HG	10	10	10
700	CR		M/P	M/Ref		Gly/HG	23	-	23
701	CR		M/P	M/Ref		Gly/HG	10	10	10
702	CR		M/P	M-U/Ref		Gly/HG	9	8	8
703	CR		M/P	M-L/Ref		Gly/HG	28	4	28
704	CR		M/P	M-U/Ref		Gly/HG	14	3	14
705	CR		MH	M-L/Ref		Gly/HG	5	4	5
706	CR		MH	M-U/Ref		Gly/HG	15	-	15
707	CR		M/P	M/Ref		Gly/HG	7	-	7
708	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	14	14	14
709	CR		M/P	M/Ref		Gly/HG	5	5	5
710	CR		M/P	M-U/Ref		Gly/HG	6	6	6
711	CR		M/P	M-U/Ref		Gly/HG	11	11	11
712	SFMZ		M/P	SFMZ/Ref		Gly/HG	1	1	1
713	SFMZ		M/P	SFMZ/Ref		Gly/HG	4	4	4
714	CR		M/P	M/Ref		Gly/HG	15	15	15
716	CR		M/P	M/Ref		Gly/HG	13	13	13
717	CR		M/P	M/Ref		Gly/HG	10	10	10
719	CR		MH	U/Ref		Gly/HG	6	5	6
722	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	15	13	13
723	SFMZ		M/P	SFMZ/Ref		Gly/HG	25	25	25
724	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	8	8	8
725	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	26	26	26
727	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	22	10	22
728	Other		HZ/HP	NRec		None	3	3	-
729	HW/P	RB	HZ/HP	UHW/P/Ref		Gly/HG	7	7	6
729	RD		RDSAL	UHW/P/Ref		Gly/HG	-	-	1
733	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	30	22	30
734	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	67	67	67
735	SFMZ		MH	SFMZ/Ref		Gly/HG	46	19	46
736	CR		MH	M/Ref		Gly/HG	34	-	36
737	SFMZ		MH	NRec		None	220	164	220
738	SFMZ		MH	SFMZ/Ref	Portions SURV	Gly/HG	122	54	122

Unit Number	Mgmt Zone	Special Treatment Designs	Initial Treatment	Reforestation Strategy		Release Methods	ALT. 2 and 5 (acres)	ALT. 3 (acres)	ALT. 4 (acres)
739	SFMZ		MH	SFMZ/Ref		Gly/HG	7	6	7
740	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	53	34	53
741	SFMZ		MH	NRec		None	1	1	1
742	SFMZ		MH	NRec		None	3	-	3
743	SFMZ		MH	NRec		None	1	1	1
744	SFMZ		MH	SFMZ/Ref		Gly/HG	3	3	3
745	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	31	18	31
746	SFMZ		MH	SFMZ/Ref		Gly/HG	10	8	10
747	SFMZ		MH	NRec		None	20	18	20
748	SFMZ		MH	NRec		None	<1	-	-
749	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	9	6	9
750	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	9	-	9
751	SFMZ		MH	NRec		None	11	9	11
752	SFMZ	CVRWB	MH	SFMZ/Ref		Mon Gly/HG	49	33	49
753	SFMZ	CVRWB	SH	SFMZ/Ref	SURV	Mon Gly/HG	11	-	11
754	SFMZ	CVRWB	MH	SFMZ/Ref	SURV	Mon Gly/HG	83	35	83
756	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	38	11	38
757	SFMZ		MH	NReg		None	9	8	9
758	SFMZ		MH	NReg		None	2	2	1
759	SFMZ		MH	NReg		None	1	1	1
760	SFMZ		MH	NReg		None	3	3	3
761	SFMZ		MH	NReg		None	4	4	4
762	SFMZ		MH	NReg		None	7	7	7
763	SFMZ		MH	NReg		None	2	2	2
764	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	30	10	30
765	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	60	33	60
766	SFMZ		MH	NReg		None	17	15	17
767	SFMZ		MH	NReg		None	21	13	21
768	SFMZ		MH	NReg		None	14	9	14
769	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	4	4	4
770	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	9	5	9
772	SFMZ		MH	NReg		None	20	19	20
773	SFMZ		MH	NReg		None	13	9	13
774	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	42	18	42
775	SFMZ		MH	NReg		None	6	5	6
776	SFMZ		MH	NReg		None	1	1	1
777	SFMZ		MH	NReg		None	29	27	29
778	SFMZ		MH	NReg		None	82	54	82

Unit Number	Mgmt Zone	Special Treatment Designs	Initial Treatment	Reforestation Strategy		Release Methods	ALT. 2 and 5 (acres)	ALT. 3 (acres)	ALT. 4 (acres)
779	SFMZ		MH	NReg		None	39	34	38
781	SFMZ		HT/HP	NRec		None	50	-	46
781	RD		RDSAL	NRec		None	-	-	4
782	SFMZ		HT/HP	NRec		None	105	-	90
782	SFMZ		RDSAL	NRec		None	-	-	15
783	SFMZ		HT/HP	NRec		None	106	-	69
783	SFMZ		RDSAL	NRec		None	-	-	38
784	SFMZ		HT/HP	NRec		None	88	15	78
784	SFMZ		RDSAL	NRec		None	-	-	11
785	SFMZ		HT/HP	NRec		None	60	58	7
785	SFMZ		RDSAL	NRec		None	-	-	53
786	SFMZ		HT/HP	NRec		PF	22	22	19
786	SFMZ		RDSAL	NRec		PF	-	-	3
787	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	24	22	24
788	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	21	17	21
789	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	11	11	11
790	SFMZ		MH	NRec		None	5	3	5
791	SFMZ	WSA	MH	SFMZ/Ref		Gly/HG	54	49	54
793	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	72	15	72
794	SFMZ		MH	NReg		None	81	45	81
795	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	372	180	372
796	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	22	6	22
797	WUI		MH	SFMZ/Ref	SURV	Gly/HG	37	37	37
798	WUI		MH	SFMZ/Ref	SURV	Gly/HG	22	22	22
799	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	7	-	7
800	SFMZ		MH	NReg		None	8	8	8
801	SFMZ		MH	NReg		None	4	4	4
802	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	5	4	5
803	SFMZ		MH	NReg		None	28	26	28
804	SFMZ		MH	SFMZ/Ref		Gly/HG	6	-	-
805	SFMZ		MH	SFMZ/Ref		Gly/HG	7	7	7
806	WUI		M/P and HZ	SFMZ/Ref		Gly/HG	49	49	49
807	WUI		HT/HP	NRec		None	58	58	58
808	WUI		HT/HP	NRec		None	10	10	10
809	WUI		MH	SFMZ/Ref	SURV	Gly/HG	34	34	34
810	WUI		MH	NReg		None	16	16	16
811	SFMZ		HT/HP	NRec		None	26	-	26
812	WUI		M/P and HZ	SFMZ/Ref		Gly/HG	15	15	15
813	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	13	11	13

Unit Number	Mgmt Zone	Special Treatment Designs	Initial Treatment	Reforestation Strategy		Release Methods	ALT. 2 and 5 (acres)	ALT. 3 (acres)	ALT. 4 (acres)
814	SFMZ	WSA	MH	SFMZ/Ref	SURV	Gly/HG	9	9	9
815	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	5	3	5
816	SFMZ	WSA	MH	SFMZ/Ref	SURV	Gly/HG	13	11	13
817	SFMZ	WSA	MH	SFMZ/Ref	SURV	Gly/HG	7	7	7
818	SFMZ	WSA	MH	SFMZ/Ref	SURV	Gly/HG	13	12	13
820	SFMZ		MH	NReg		None	3	3	3
821	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	13	-	13
822	SFMZ		MH	SFMZ/Ref		Gly/HG	2	-	2
823	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	4	1	4
824	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	28	4	28
825	SFMZ		MH	NReg		None	7	7	7
826	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	107	58	107
827	WUI		M/P and HZ	NRec		None	208	208	208
828	SFMZ		M/P	NRec		None	4	3	4
829	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	2	2	2
830	SFMZ		M/P	NRec		None	19	1	19
831	SFMZ	WSA	MH	SFMZ/Ref	SURV	Gly/HG	3	3	3
832	SFMZ	CVRWB	M/P	NRec		None	8	7	8
833	SFMZ		M/P	NRec		None	4	3	4
834	SFMZ		M/P	NRec		None	14	2	14
835	SFMZ		M/P	NRec		None	13	11	13
836	SFMZ		M/P	SFMZ/Ref		Gly/HG	4	4	4
837	SFMZ		M/P	NRec		None	5	4	5
838	SFMZ		M/P	NRec		None	11	11	11
839	WUI		M/P	NRec		None	7	7	7
842	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	5	4	5
844	CR		M/P	M-L/Ref	SURV	Gly/HG	8	-	8
845	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	11	7	11
846	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	23	3	23
847	CR		M/P	M-L/Ref	SURV	Gly/HG	6	-	6
848	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	9	6	9
849	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	16	-	16
850	SFMZ		M/P	NRec		None	12	8	12
851	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	27	13	27
852	WUI		MH	NReg		None	46	46	46
853	SFMZ	WSA	MH	SFMZ/Ref	SURV	Gly/HG	25	19	25
856	CR		M/P	U/Ref	SURV	Gly/HG	16	-	16
857	SFMZ	CVRWB	M/P	SFMZ/Ref	SURV	Mon Gly/HG	17	11	17

Unit Number	Mgmt Zone	Special Treatment Designs	Initial Treatment	Reforestation Strategy		Release Methods	ALT. 2 and 5 (acres)	ALT. 3 (acres)	ALT. 4 (acres)
858	SFMZ	CVRWB	M/P	SFMZ/Ref	SURV	Mon Gly/HG	13	9	13
859	SFMZ		M/P	NRec		None	23	20	23
860	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	12	10	12
861	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	15	3	15
862	CR		M/P	M-L/Ref	SURV	Gly/HG	8	-	9
867	CR		M/P	U/Ref	SURV	Gly/HG	4	-	4
868	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	32	24	32
870	SFMZ	WSA	M/P	SFMZ/Ref		Gly/HG	21	12	21
871	WUI		M/P	SFMZ/Ref	SURV	Gly/HG	4	4	4
872	WUI		M/P	SFMZ/Ref	SURV	Gly/HG	4	4	4
873	WUI		M/P	SFMZ/Ref	SURV	Gly/HG	17	16	16
874	SFMZ		P/Rel	SFMZ/Ref	SURV	Gly/HG	8	5	8
876	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	13	-	13
877	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	31	-	31
878	CR	WSA	M/P	M-L/Ref	SURV	Gly/HG	23	4	23
879	SFMZ		M/P	SFMZ/Ref		Gly/HG	9	2	9
880	SFMZ		M/P	SFMZ/Ref		Gly/HG	11	3	11
881	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	6	-	6
882	CR		M/P	U/Ref	SURV	Gly/HG	6	-	6
883	SFMZ	WSA	M/P	SFMZ/Ref		Gly/HG	16	16	16
884	WUI		MH	SFMZ/Ref	SURV	Gly/HG	14	14	14
885	CR		P/Rel	M-U/Ref		Gly/HG	2	-	2
886	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	173	98	173
887	CR		M/P	M-L/Ref	SURV	Gly/HG	5	-	5
888	CR		M/P	M-L/Ref	SURV	Gly/HG	8	-	8
889	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	9	8	9
890	CR		M/P	M-L/Ref	SURV	Gly/HG	13	-	13
891	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	3	3	3
892	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	11	-	11
893	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	3	3	3
894	SFMZ		M/P	SFMZ/Ref		Gly/HG	16	14	16
895	SFMZ		M/P	SFMZ/Ref		Gly/HG	19	-	19
896	SFMZ		M/P	SFMZ/Ref		Gly/HG	24	2	24
897	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	11	4	11
898	SFMZ		M/P	SFMZ/Ref		Gly/HG	2	-	2
899	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	18	17	18
900	SFMZ		M/P	SFMZ/Ref		Gly/HG	4	1	4
901	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	6	6	6
902	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	8	3	8

Unit Number	Mgmt Zone	Special Treatment Designs	Initial Treatment	Reforestation Strategy		Release Methods	ALT. 2 and 5 (acres)	ALT. 3 (acres)	ALT. 4 (acres)
903	SFMZ		P/Rel	SFMZ/Ref	SURV	Gly/HG	2	1	2
904	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	5	-	5
905	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	15	11	15
906	SFMZ		HZ/HP	SFMZ/Ref	SURV	Gly/HG	33	19	18
906	RD		RDSAL	SFMZ/Ref	SURV	Gly/HG	-	-	15
907	SFMZ		P/Rel	SFMZ/Ref	SURV	Gly/HG	1	1	1
908	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	7	7	7
910	SFMZ		MH	NReg		None	81	55	81
912	SFMZ		HZ/HP	NRec		None	66	59	25
912	SFMZ		RDSAL	NRec		None	-	-	41
914	CR	WSA	WS	L/Ref		Gly/HG	46	46	46
915	SFMZ	WSA	WS	SFMZ/Ref		Gly/HG	21	21	21
916	SFMZ	WSA	WS	SFMZ/Ref		Gly/HG	10	10	7
917	Other	WSA	WS	NRec		None	8	8	8
918	CR	WSA	WS	U/Ref		Gly/HG	16	16	16
919	Other	WSA	WS	NRec		None	20	20	20
924	WUI		HZ/HP	NRec		None	77	77	56
924	RD		RDSAL	NRec		None	-	-	21
925	WUI		M/P and HZ	NRec		None	192	192	192
926	WUI		HT/HP	NRec		None	5	5	5
927	SFMZ	WSA	MH	SFMZ/Ref		Gly/HG	74	39	74
928	SFMZ		MH	SFMZ/Ref		Gly/HG	90	53	90
929	SFMZ		MH	SFMZ/Ref		Gly/HG	2	2	2
932	SFMZ	WSA	WS	NRec		None	3	3	3
933	CR	WSA	WS			Gly/HG	43	43	43
935	WUI	WSA	HT/HP	NRec		None	152	152	124
935	WUI		RDSAL	NRec		None	-	-	27
936	SFMZ	WSA	MH	SFMZ/Ref	SURV	Gly/HG	248	163	248
937	SFMZ		MH	NReg		None	1	-	2
938	SFMZ		MH	NReg		None	3	-	3
939	SFMZ		MH	SFMZ/Ref		Gly/HG	16	-	16
941	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	76	47	76
942	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	46	29	46
943	SFMZ		MH	NReg		None	34	17	34
944	SFMZ		MH	NReg		None	44	28	44
945	SFMZ		MH	NReg		None	18	12	18
946	SFMZ		MH	NReg		None	59	32	59
947	SFMZ		MH	NReg		None	53	47	53
948	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	20	-	20

Unit Number	Mgmt Zone	Special Treatment Designs	Initial Treatment	Reforestation Strategy		Release Methods	ALT. 2 and 5 (acres)	ALT. 3 (acres)	ALT. 4 (acres)
949	SFMZ		MH	NReg		None	25	5	25
950	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	100	49	100
951	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	2	2	2
953	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	130	62	130
954	SFMZ		MH	SFMZ/Ref	SURV	Gly/HG	59	15	59
955	Other	WSA	WS	NRec		None	20	20	20
956	Other		HZ/HP	NRec		None	5	5	4
956	RD		RDSAL	NRec		None	-	-	1
957	SFMZ		M/P	SFMZ/Ref	SURV	Gly/HG	19	19	19
959	SFMZ		M/P and HZ	NRec		None	16		16
2026	CR		MH	U/Ref	SURV	Gly/HG	-	-	149
2027	CR		MH	U/Ref	SURV	Gly/HG	-	-	14
2028	CR		MH	M-U/Ref	SURV	Gly/HG	-	-	38
2029	CR		MH	U/Ref	SURV	Gly/HG	-	-	15
2030	SFMZ		MH	NReg		None	-	-	3
2031	SFMZ		MH	NReg		None	-	-	2
4000	CR		MH	M-L/Ref		Gly/HG	-	-	43
4001	CR		MH	NReg		None	-	-	9
4002	CR		MH	M-L/Ref	Portions SURV	Gly/HG	-	-	16
4003	CR		MH	M-L/Ref		Gly/HG	-	-	12
4004	CR		MH	M-L/Ref	SURV	Gly/HG	-	-	10
4005	CR		M/P	M-U/Ref	Portions SURV	Gly/HG	-	-	19
4006	WUI		HT/HP	NRec		None	-	-	27
4007	CR		SH	Upper to L/Ref		Gly/HG	-	-	49
4008	WUI		HT/HP	NRec		None	-	-	43
4009	WUI		HT/HP	NRec		None	-	-	25
4009	WUI		RDSAL	NRec		None	-	-	16
4010	CR		SH	Upper to L/Ref	SURV	Gly/HG	-	-	48
4011	CR		SH	M-L/Ref		Gly/HG	-	-	70
4012	CR		MH	Upper to L/Ref	SURV	Gly/HG	-	-	30
4013	CR		MH	M-L/Ref	SURV	Gly/HG	-	-	20
4014	WUI		HT/HP	NRec		None	-	-	19
4015	WUI		HT/HP	NRec		None	-	-	26
4016	WUI		HT/HP	NRec		None	-	-	3
4016	WUI		RDSAL	NRec		None	-	-	2
4017	SFMZ		MH	NReg		Gly/HG	-	-	44
4018	SPLAT		MH	NReg		None	-	-	40

Unit Number	Mgmt Zone	Special Treatment Designs	Initial Treatment	Reforestation Strategy		Release Methods	ALT. 2 and 5 (acres)	ALT. 3 (acres)	ALT. 4 (acres)
4019	CR		SH	NReg		None	-	-	45
4020	SPLAT		MH	M-U/Ref		Gly/HG	-	-	124
4021	CR		SH	M-U/Ref	Portions SURV	Gly/HG	-	-	61
4022	CR		MH	NReg		None	-	-	16
4023	SFMZ		MH	NReg		None	-	-	12
4024	SFMZ		MH	M-L/Ref		None	-	-	5
4025	Other		SH	NReg		None	-	-	369
5000	RD		RDSAL	NRec		None	-	-	3,604

APPENDIX E

Evaluation of California Spotted Owl PACs in the King Fire

For updated project survey data and information, please refer to the Terrestrial Wildlife Biological Evaluation (BE) which is part of the Administrative Record. Protected Activity Centers or PACs are land management allocations that are identified and managed to provide nesting and roosting habitat for Spotted Owls. This species is designated as Sensitive by the Regional Forester to receive special management consideration. Specific standards and guidelines have been developed for conservation of this species and are part of the Forest Plan direction for the Eldorado National Forest. Forty-six PACs occurred wholly or partially with the King Fire (Table 1).

Table 1. PACs located entirely or partially within the boundary of the King Fire.

Species	# of PACs on the Eldorado NF	# of PACs in the King Fire
California spotted owl	214	46

Forest Plan direction requires that following a disturbance event such as the King Fire, habitat conditions be evaluated to determine whether there is sufficient suitable habitat remaining in the PAC after the event or if there are opportunities for re-mapping the PAC to better encompass suitable habitat within a 1.5-mile distance from the owl activity center. The following habitat evaluation was conducted in order to remap PACs. The PAC mapping process is ongoing and adaptive since results from 2015 and subsequent spotted owl surveys will be used to further adjust PAC boundaries and to delineate additional or new PACs where new territorial spotted owls are detected. The following information has been used to evaluate habitat conditions: post-fire imagery (Worldview imagery from January 2015), burn severity mapping (basal area loss determined from RAVG BA4, 10/07/2014, and Forest Service e-vegetation database, NRM 2005).

Spotted Owl PACs

Wildlife biologists from the Eldorado National Forest evaluated habitat conditions within and around each of the 46 spotted owl PACs in the fire area. The location and amount of post-fire nesting/roosting habitat was evaluated for each owl territory at the following scales: 1) within the boundary of the PAC; 2) within a circular 1,000-ac territory (represented by a 1,128-m circle surrounding the territory center); and 3) within 1.5 miles of the owl activity center (defined as the most recent nest or roost location) (Table 2). Pre-fire habitat was mapped as the following California Wildlife Habitat Relationships (CWHR) size and canopy cover classes in conifer and montane hardwood-conifer types: size classes 4, 5 and 6, canopy cover classes M and D. Post-fire nesting/roosting habitat was assumed to occur in pre-fire habitat with less than 50 percent basal area mortality, using RAVG mapping.

Habitat in PACs prior to and following remapping is displayed in Table 3; 10 PACs that have not been remapped are shown in Table 4 and Figure 1. PACs were not retained or remapped for 10 spotted owl activity centers within the King Fire. These activity centers had less than 10 acres of habitat with less than 50% basal area mortality remaining in the PAC and within 0.7 miles of the territory center. The

PACs listed in Tables 3 and 4 are individually displayed with Worldview post-fire imagery (January 2015). Live vegetation appears red in the imagery.

Table 2. Pre-fire habitat and post-fire nesting/roosting habitat on NFS lands in PACs, circular territories, and within a 1.5 mile radius of owl activity centers (ACs).

CSO PAC ID	Pre-fire Habitat In PAC	Post-fire Nesting/Roosting Habitat in PAC	Post-Fire Nesting/Roosting Habitat in 1,000-ac Territory	Post-Fire Nesting/Roosting Habitat within 1.5-mi from AC[1]
ELD0001	291	291	482	1192
ELD0009	362	358	401	888
ELD0012	279	232	563	1727
ELD0015	300	219	553	2032
ELD0036	270	148	290	526
ELD0040	273	53	77	490
ELD0042	278	221	546	1252
ELD0051	288	201	257	617
ELD0052	294	149	207	850
ELD0057	305	65	191	731
ELD0058	300	75	172	651
ELD0060	300	107	255	1156
ELD0067	308	150	74	1618
ELD0068	289	3	15	144
ELD0081	304	304	645	2610
ELD0085	300	17	71	199
ELD0086	319	305	588	1814
ELD0140	297	16	217	618
ELD0206	24	8	207	689
ELD0213	367	367	580	904
ELD0216	296	175	399	1359
ELD0217	259	243	447	1341
ELD0219	307	282	142	508
ELD0300	263	113	95	458
ELD0303	289	231	420	1164
PLA0007	283	139	241	698
PLA0011	295	295	471	1777
PLA0012	300	0	0	0
PLA0013	269	269	373	1000
PLA0015	295	0	0	281
PLA0016	304	304	481	591
PLA0038	306	306	493	1327
PLA0039	303	130	269	1026
PLA0040	300	290	509	1326
PLA0043	263	0	2	82
PLA0049	255	0	5	102
PLA0050	274	0	0	25
PLA0051	274	201	297	775
PLA0065	233	0	4	368
PLA0067	299	0	2	62

CSO PAC ID	Pre-fire Habitat In PAC	Post-fire Nesting/Roosting Habitat in PAC	Post-Fire Nesting/Roosting Habitat in 1,000-ac Territory	Post-Fire Nesting/Roosting Habitat within 1.5-mi from AC[1]
PLA0080	257	174	408	1050
PLA0098	285	285	494	607
PLA0101	165	155	194	540
PLA0109	271	0	0	26
PLA0113	296	7	7	131
PLA0122	306	206	421	977

1Figures do not include acreages overlapping with other spotted owl PACs.

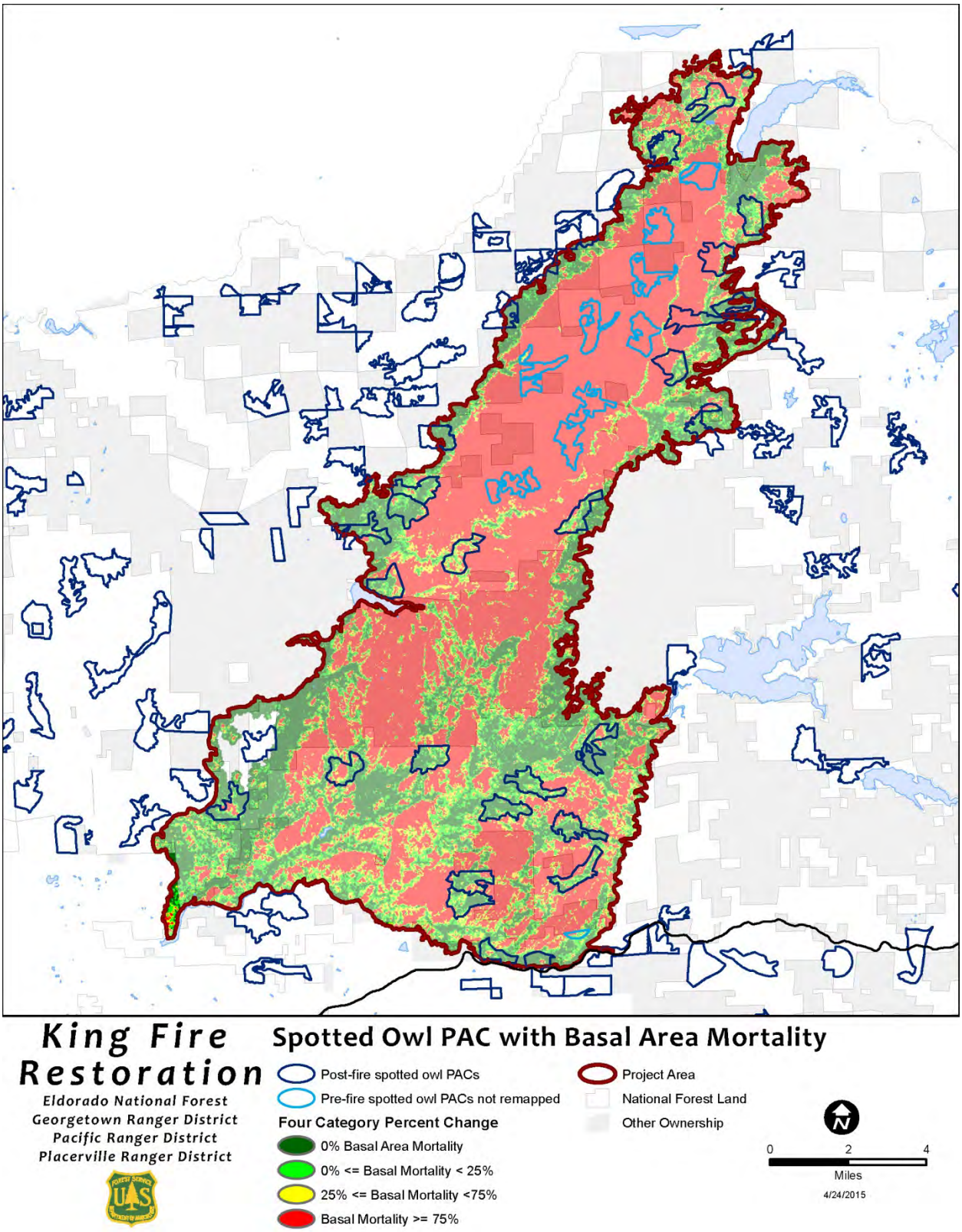
Table 3. PACs Remapped.

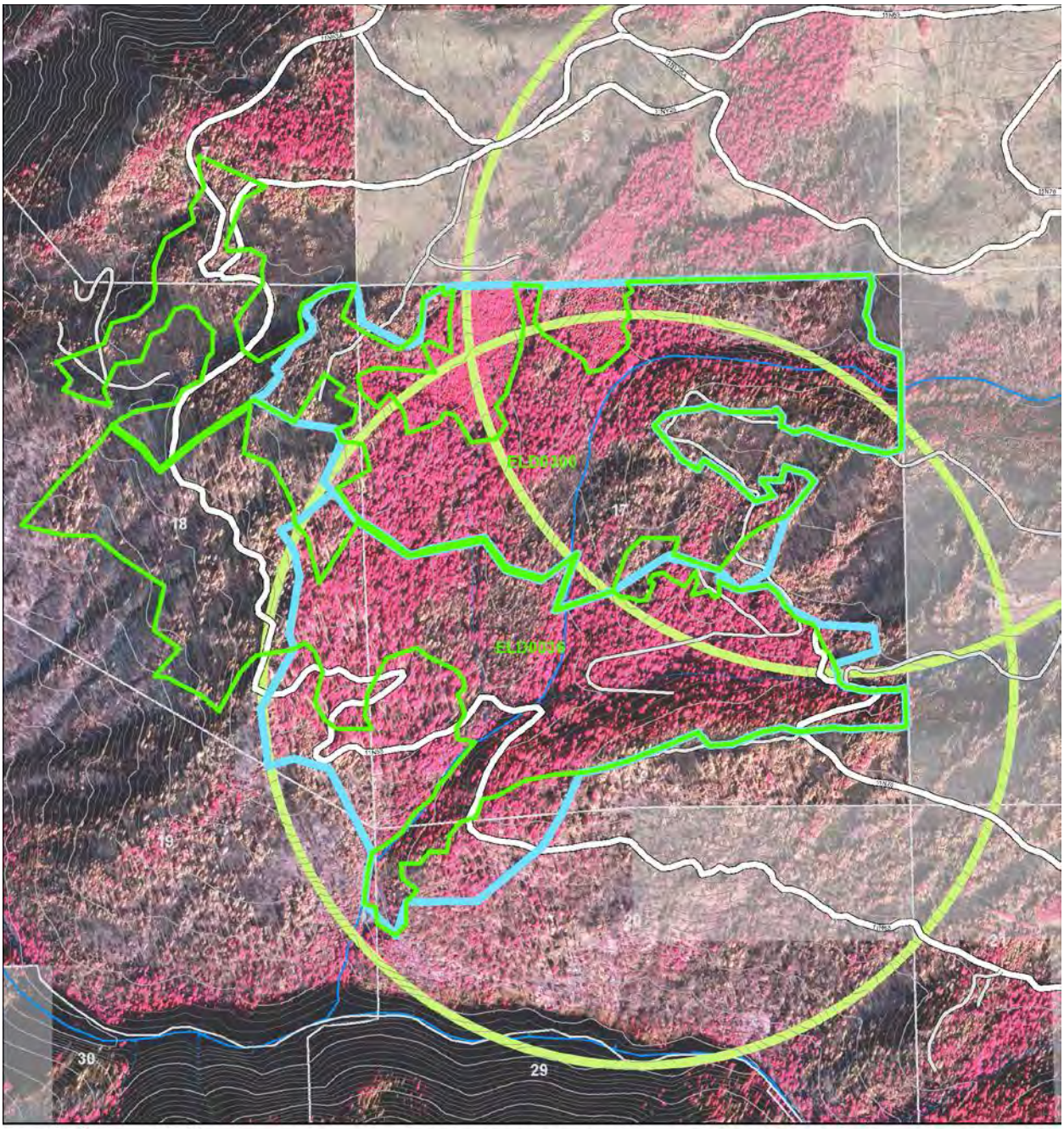
CSO PAC ID	Post-fire Nesting/Roosting Habitat in PAC	Post-fire Nesting/Roosting Habitat in Remapped PAC
PLA0007	139	139
PLA0051	201	201
ELD0036	148	173
ELD0040	53	77
ELD0052	149	188
ELD0068	3	46
ELD0085	17	150
ELD0140	16	142
ELD0216	175	215
ELD0300	113	124
ELD0303	231	237
PLA0039	130	208
PLA0080	174	192

Table 4. Habitat information for PACs not remapped.

CSO PAC ID	Post-fire Nesting/Roosting Habitat in PAC	Post-Fire Nesting/Roosting Habitat in 1,000-ac Territory	Post-Fire Nesting/Roosting Habitat within 1.5-mi from AC[1]	Reason for not Remapping
ELD0206	**8**	**207**	**689**	Activity Center occurred on private land.
PLA0012	**0**	**0**	**0**	Insufficient nesting/roosting habitat within 1.5 miles of activity center
PLA0015	**0**	**0**	**281**	281 acres of nesting/roosting habitat is alongside PAC PLA0053 and surrounded by industrial timberlands – surrounding foraging habitat is highly limited.
PLA0043	**0**	**2**	**82**	Insufficient nesting/roosting habitat within 1.5 miles of activity center (see map)

CSO PAC ID	Post-fire Nesting/Roosting Habitat in PAC	Post-Fire Nesting/Roosting Habitat in 1,000-ac Territory	Post-Fire Nesting/Roosting Habitat within 1.5-mi from AC[1]	Reason for not Remapping
PLA0049	**0**	**5**	**102**	Remaining habitat occurs in a small stringer along the Rubicon River and along the fire perimeter 1.5 miles from A.C. (see map). Unclear where to map a PAC.
PLA0050	**0**	**0**	**25**	Insufficient nesting/roosting habitat within 1.5 miles of activity center.
PLA0065	**0**	**4**	**368**	Possible remap west of Hell Hole Reservoir – no project activities are planned within this PAC – remapping will occur following surveys.
PLA0067	**0**	**2**	**62**	Insufficient nesting/roosting habitat within 1.5 miles of activity center (see map)
PLA0109	**0**	**0**	**26**	Insufficient nesting/roosting habitat within 1.5 miles of activity center (see map)
PLA0113	**7**	**7**	**131**	Private timberlands separate the 131 acres of nesting/roosting habitat on NFS from the current territory center by more than a mile.


King Fire Restoration
Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District
Spotted Owl PAC with Basal Area Mortality
Post-fire spotted owl PACs
Pre-fire spotted owl PACs not remapped
Four Category Percent Change
0% Basal Area Mortality
0% <= Basal Mortality < 25%
25% <= Basal Mortality <75%
Basal Mortality >= 75%
Project Area
National Forest Land
Other Ownership
0
2
4
Miles
4/24/2015



King Fire Restoration

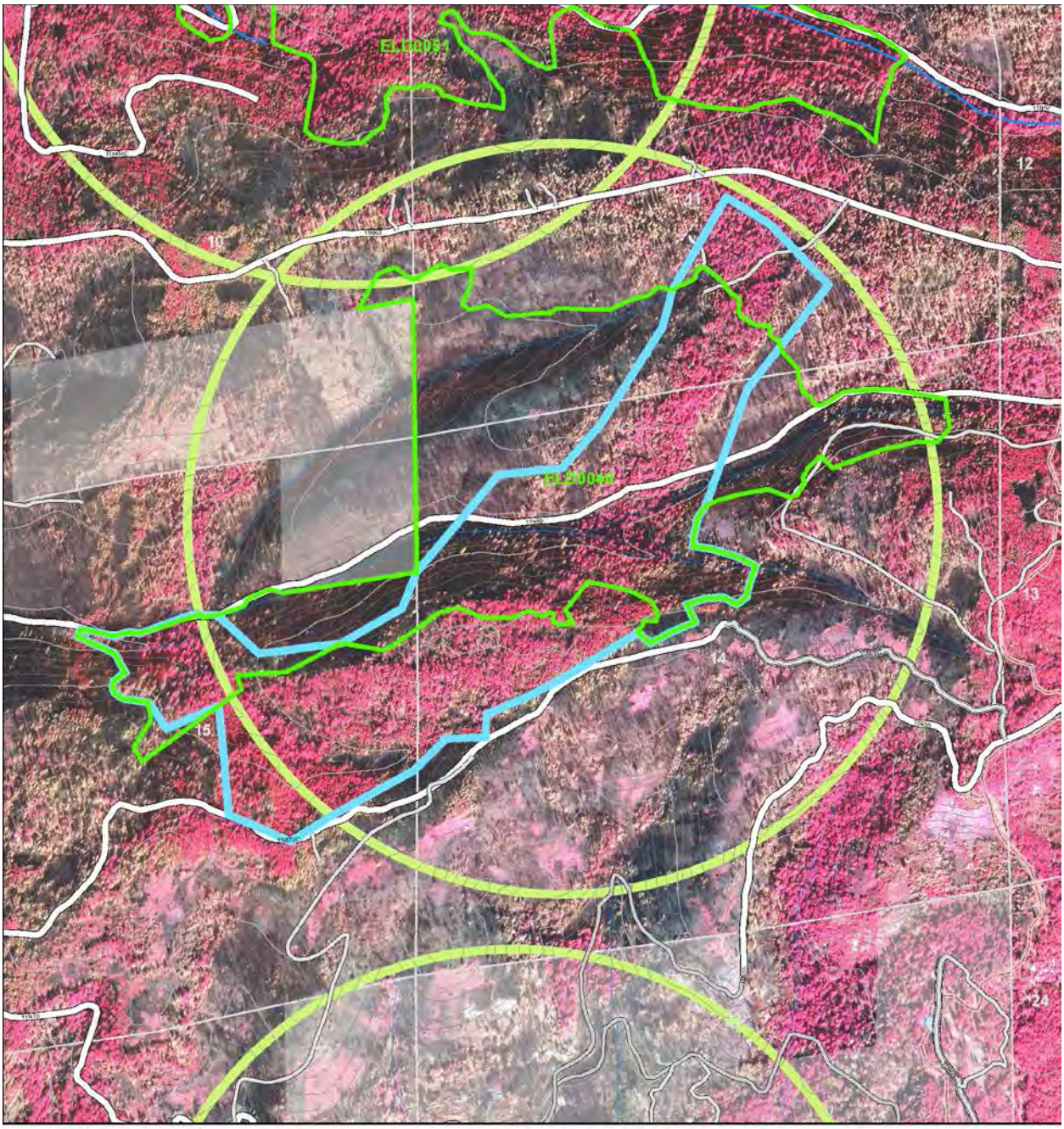
Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District

Spotted Owl PAC - ELD0036 & ELD0300

- Pre-fire Spotted Owl PAC
- Remapped Post-fire Spotted Owl PAC
- Spotted Owl Territory Area (1,128 meter radius circle)
- Project Area
- Road
- State Highway
- County Road
- Private Road
- National Forest Land
- Other Ownership

0 0.125 0.25 Miles

5/5/2015



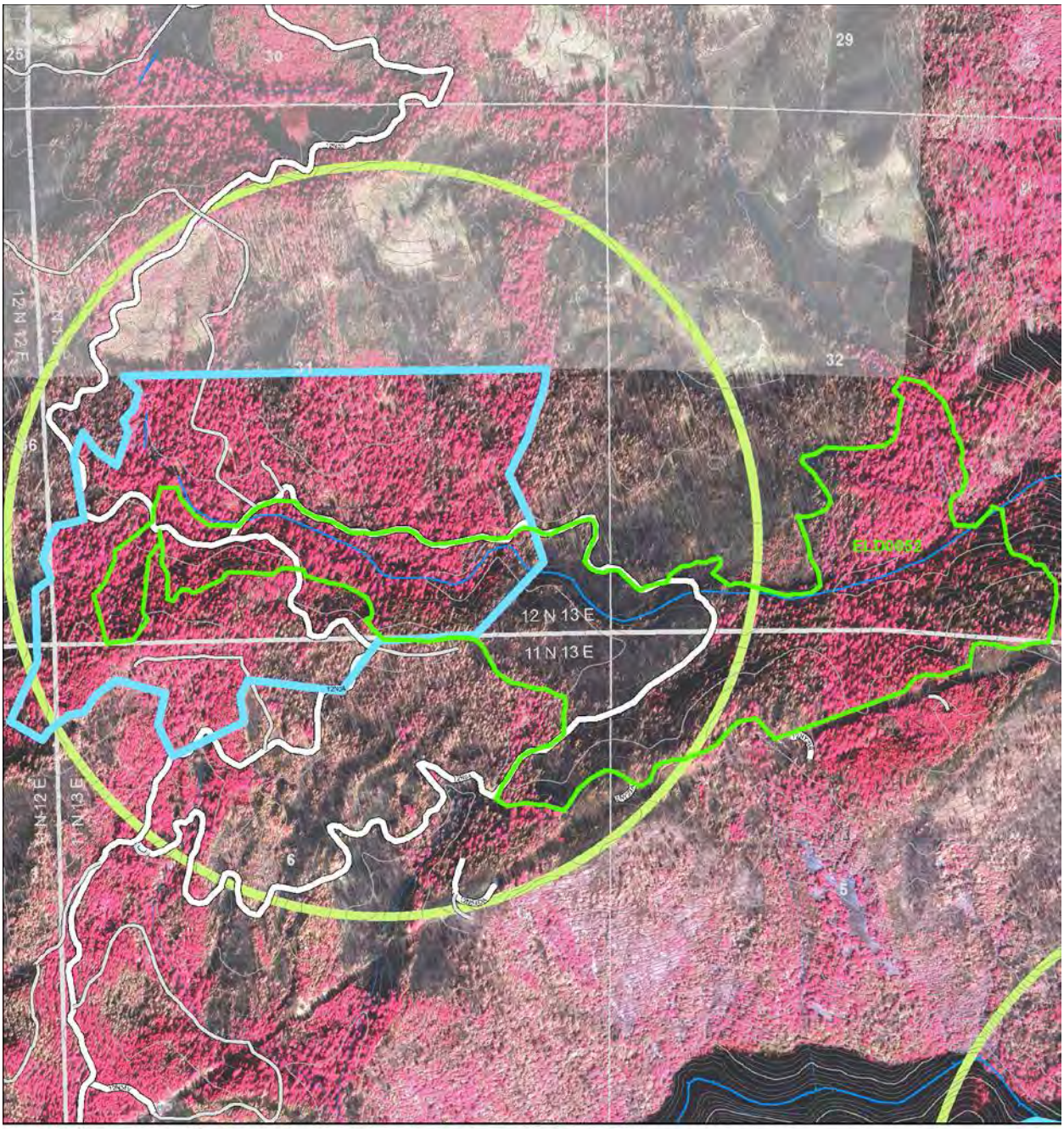
King Fire Restoration

Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District

Spotted Owl PAC - ELD0040

- Pre-fire Spotted Owl PAC
- Remapped Post-fire Spotted Owl PAC
- Spotted Owl Territory Area (1,128 meter radius circle)
- Project Area
- Road
- State Highway
- County Road
- Private Road
- National Forest Land
- Other Ownership

0 0.125 0.25
Miles
5/5/2015



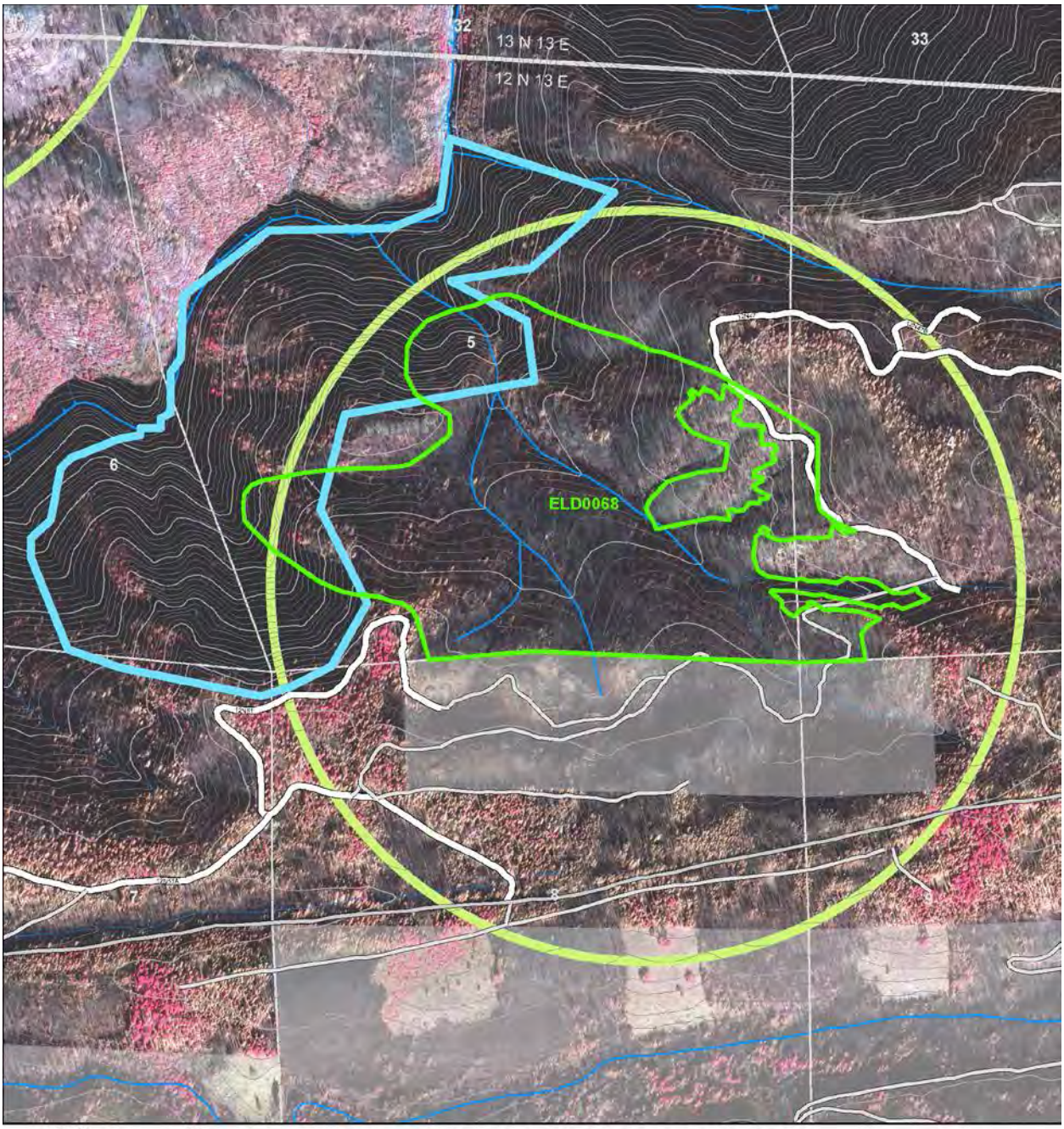
King Fire Restoration

Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District

Spotted Owl PAC - ELD0052

- Pre-fire Spotted Owl PAC
- Remapped Post-fire Spotted Owl PAC
- Spotted Owl Territory Area (1,128 meter radius circle)
- Project Area
- Road
- State Highway
- County Road
- Private Road
- National Forest Land
- Other Ownership

0 0.125 0.25
Miles
5/5/2015



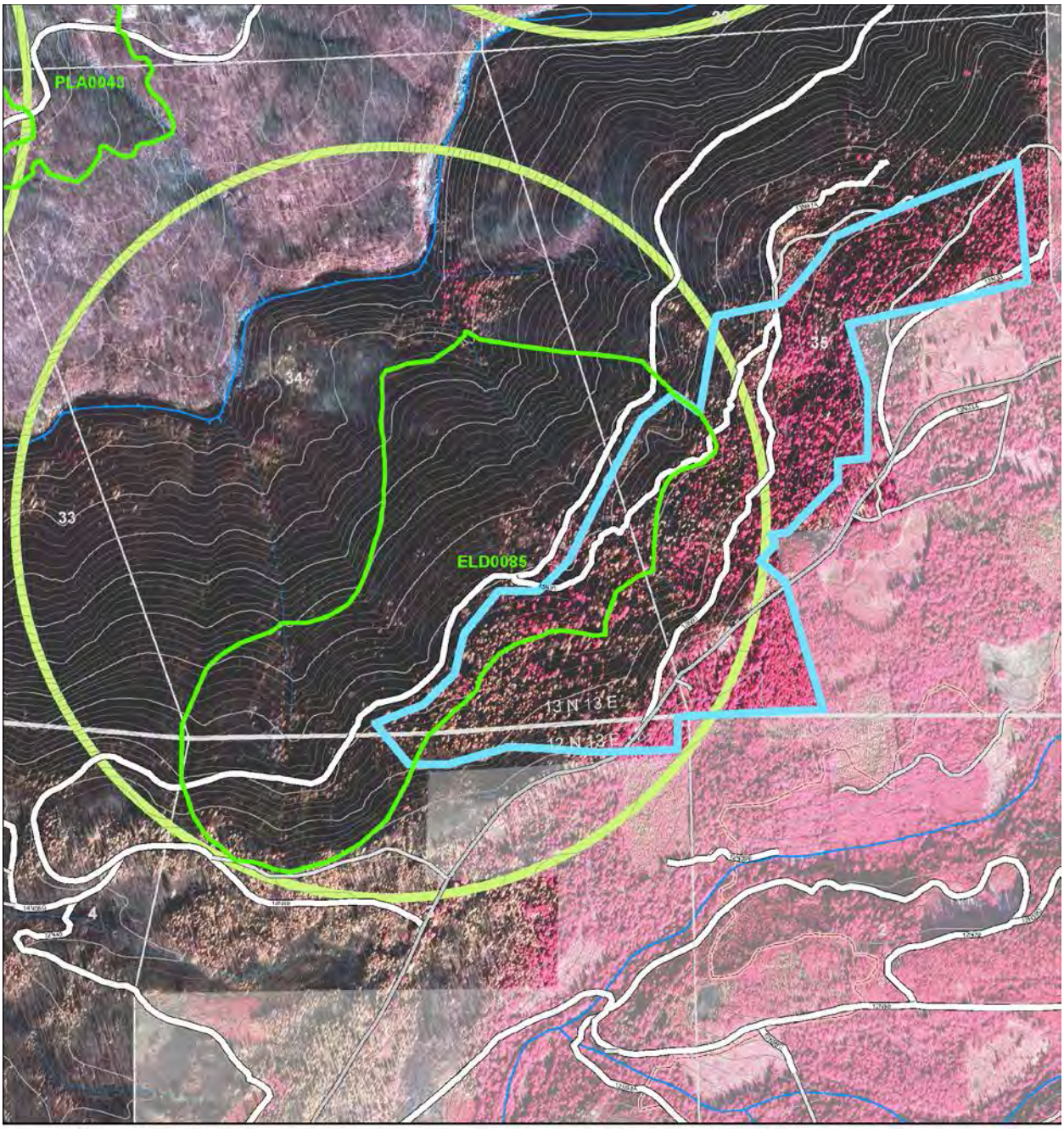
King Fire Restoration

Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District

Spotted Owl PAC - ELD0068

- Pre-fire Spotted Owl PAC
- Remapped Post-fire Spotted Owl PAC
- Spotted Owl Territory Area (1,128 meter radius circle)
- Project Area
- Road
- State Highway
- County Road
- Private Road
- National Forest Land
- Other Ownership

0 0.125 0.25
Miles
5/5/2015



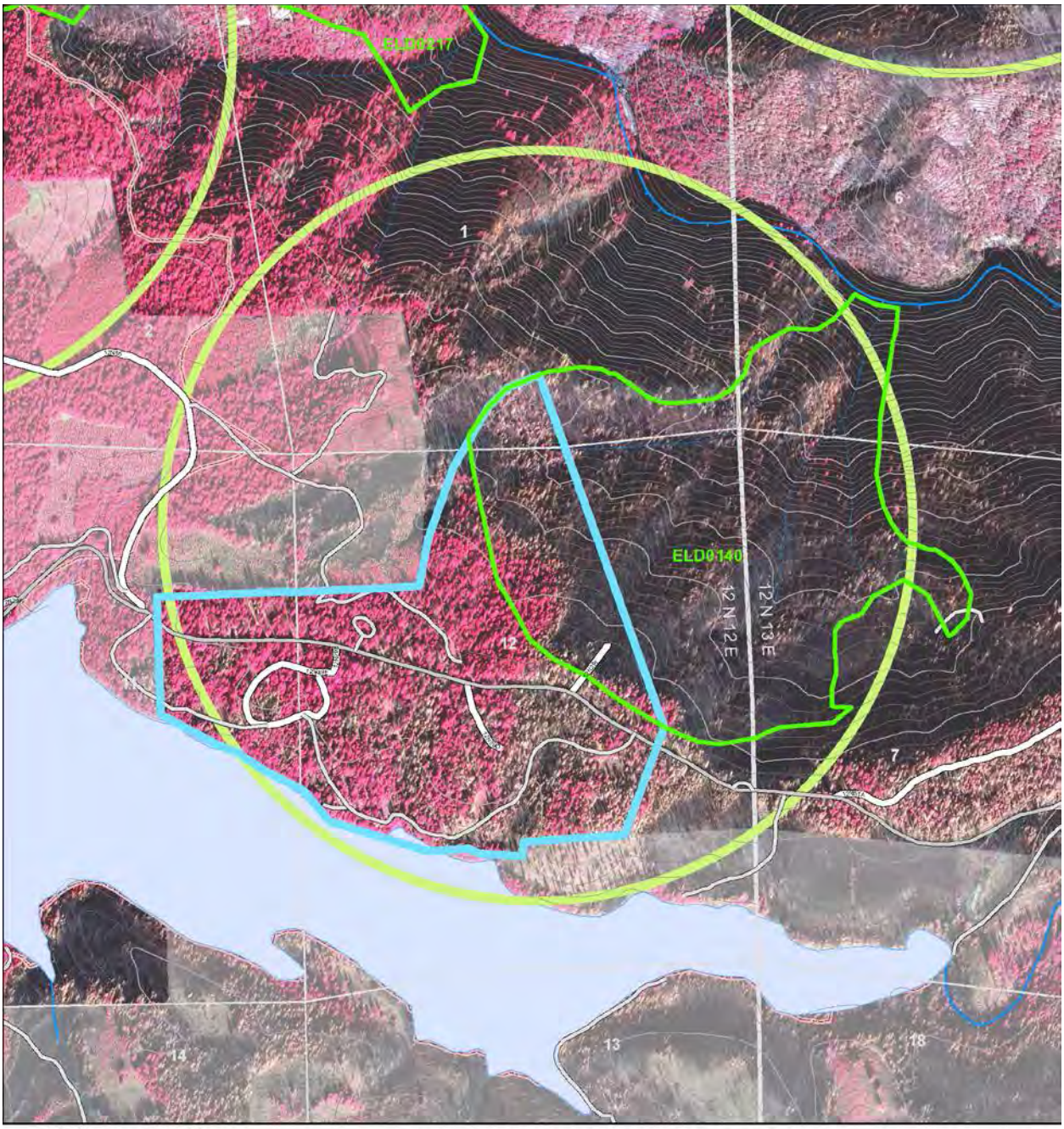
King Fire Restoration

Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District

Spotted Owl PAC - ELD0085

- Pre-fire Spotted Owl PAC
- Remapped Post-fire Spotted Owl PAC
- Spotted Owl Territory Area (1,128 meter radius circle)
- Project Area
- Road
- State Highway
- County Road
- Private Road
- National Forest Land
- Other Ownership

0 0.125 0.25
Miles
5/5/2015



King Fire Restoration

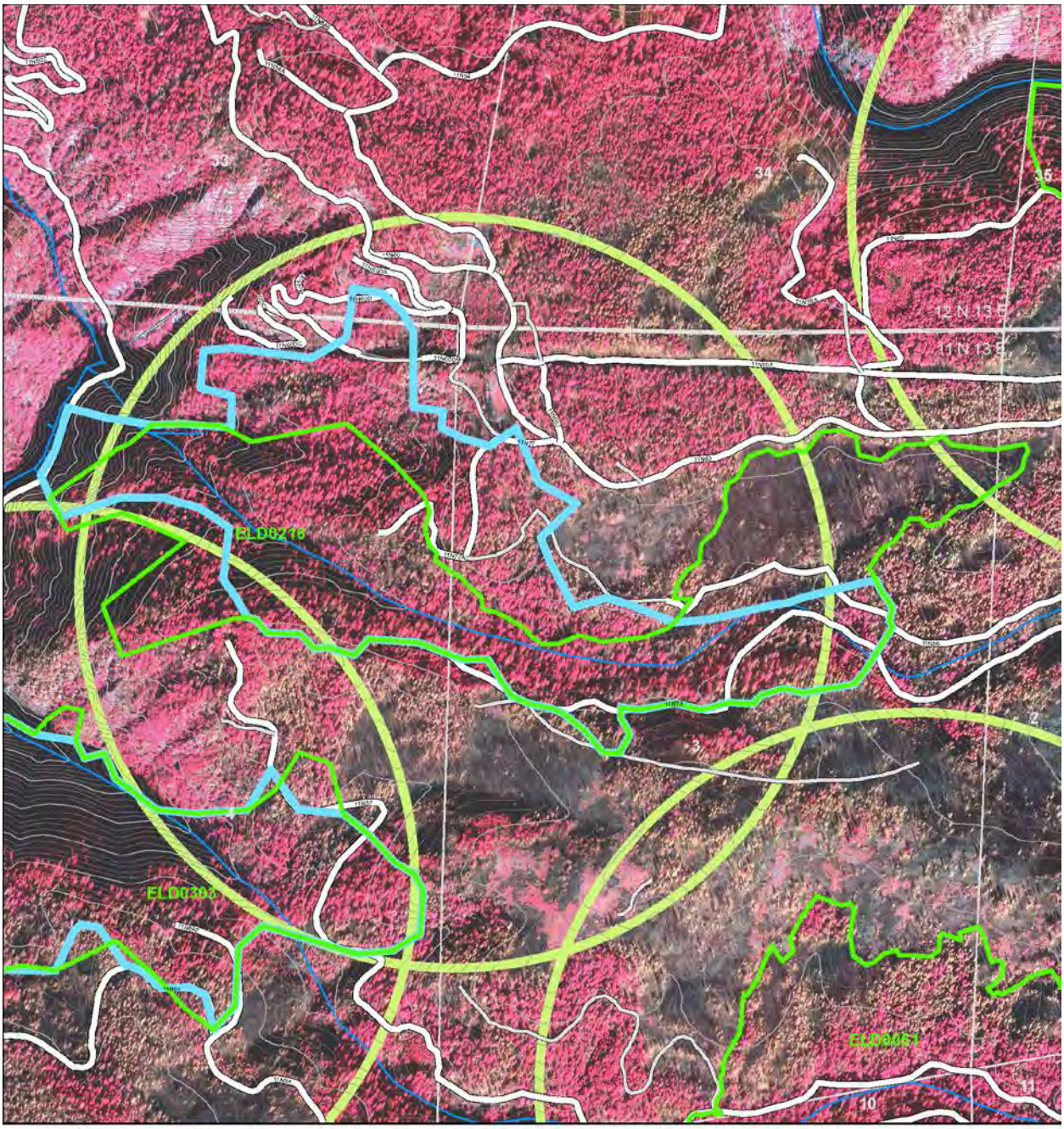
Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District

Spotted Owl PAC - ELD0140

- Pre-fire Spotted Owl PAC
- Remapped Post-fire Spotted Owl PAC
- Spotted Owl Territory Area (1,128 meter radius circle)
- Project Area
- Road
- State Highway
- County Road
- Private Road
- National Forest Land
- Other Ownership

0 0.125 0.25 Miles

5/5/2015



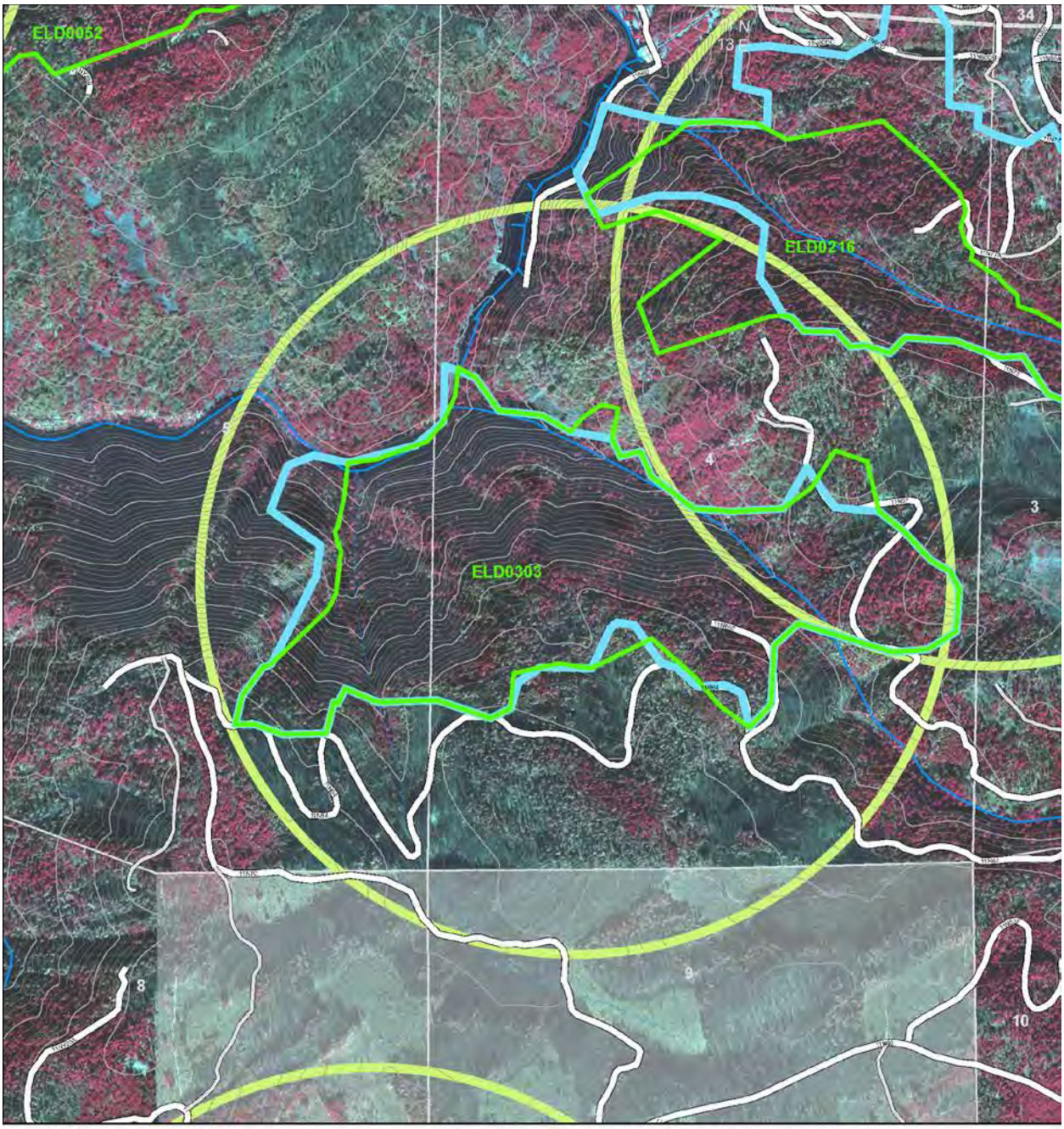
King Fire Restoration

Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District

Spotted Owl PAC - ELD0216

- Pre-fire Spotted Owl PAC
- Remapped Post-fire Spotted Owl PAC
- Spotted Owl Territory Area (1,128 meter radius circle)
- Project Area
- Road
- State Highway
- County Road
- Private Road
- National Forest Land

0 0.125 0.25
Miles
5/5/2015



King Fire Restoration

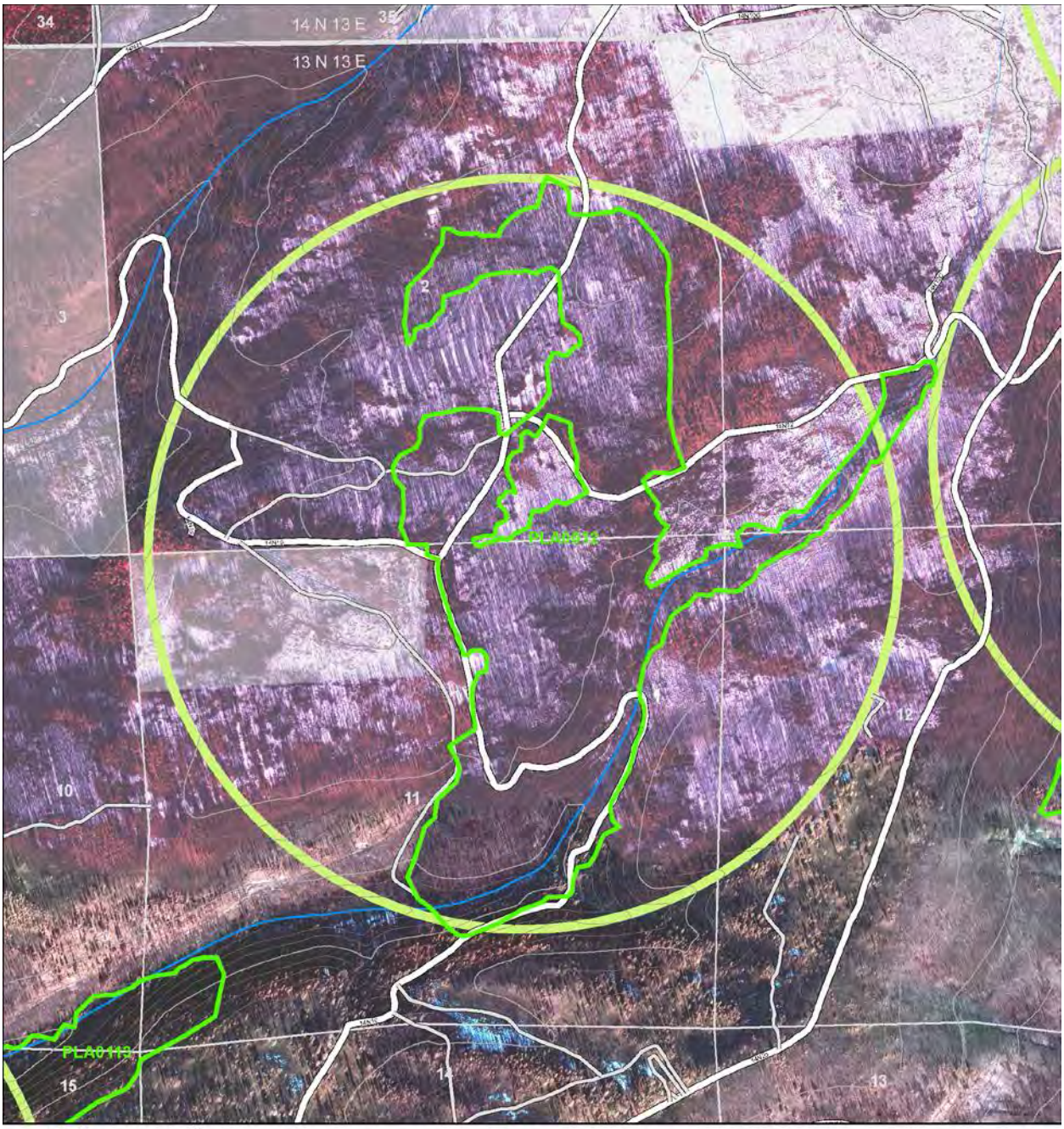
Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District

Spotted Owl PAC - ELD0303

- Pre-fire Spotted Owl PAC
- Remapped Post-fire Spotted Owl PAC
- Spotted Owl Territory Area (1,128 meter radius circle)
- Project Area
- Road
- State Highway
- County Road
- Private Road
- National Forest Land
- Other Ownership

0 0.125 0.25 Miles

5/5/2015



King Fire Restoration

Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District

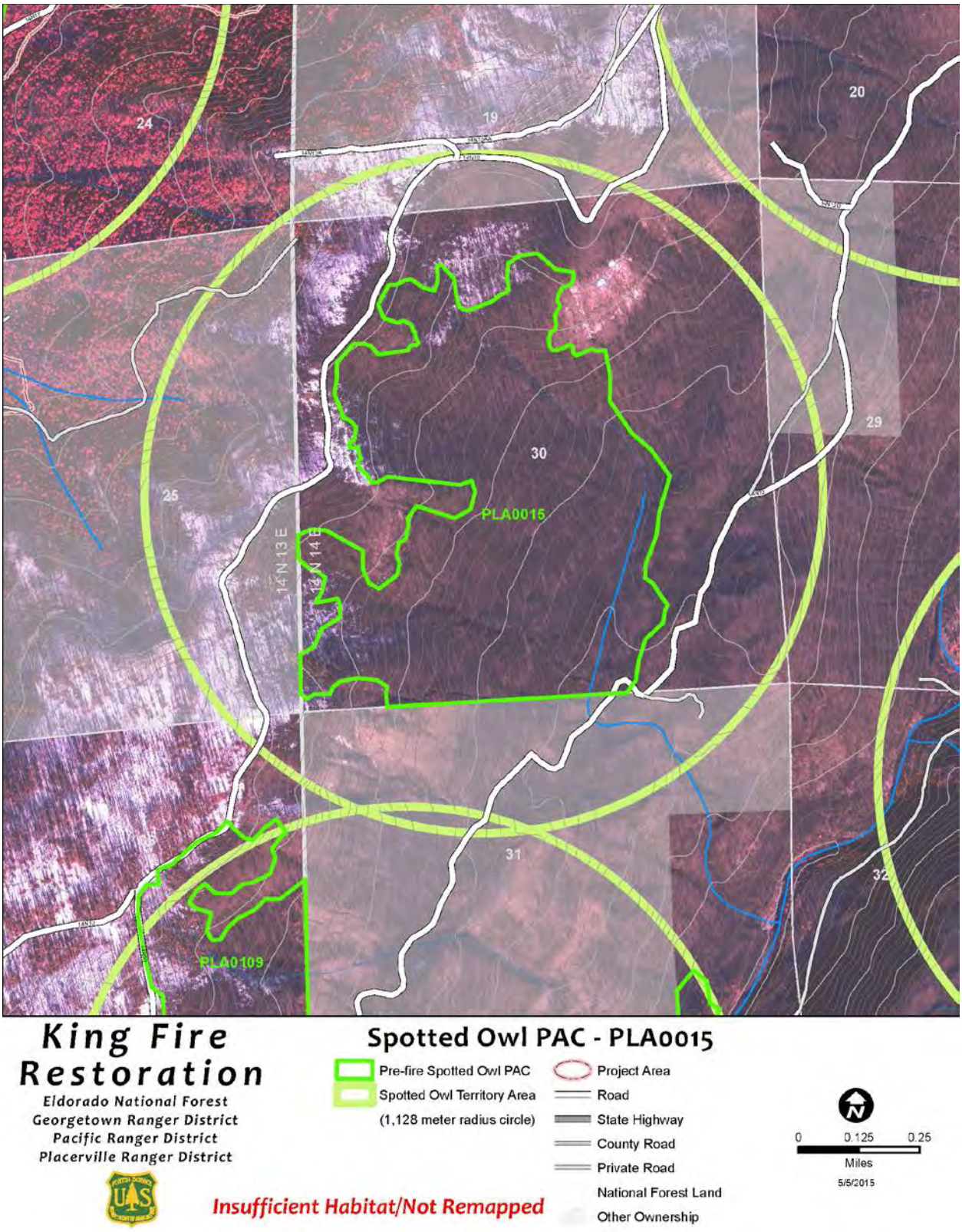
Spotted Owl PAC - PLA0012

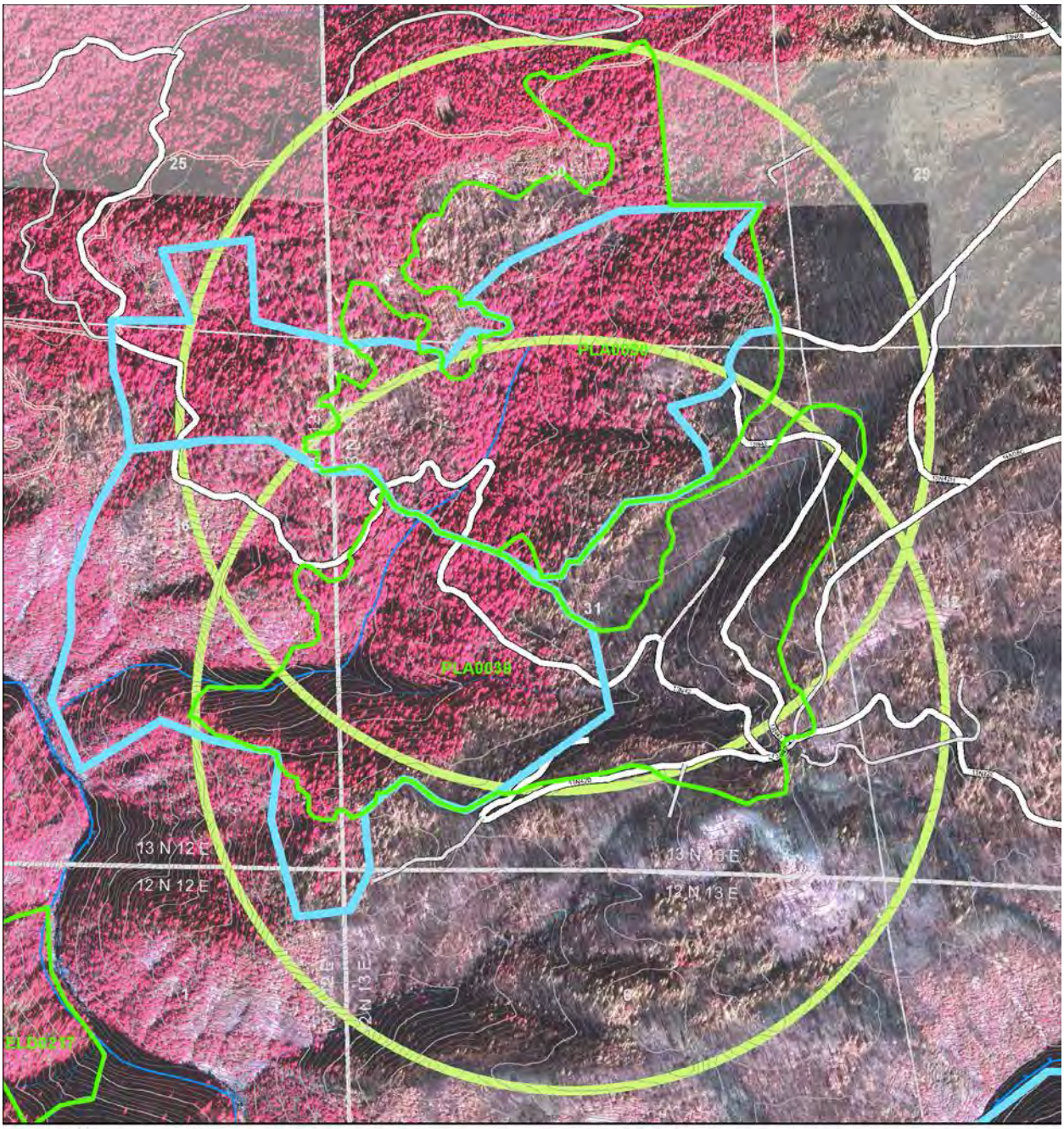
Pre-fire Spotted Owl PAC
Spotted Owl Territory Area
(1,128 meter radius circle)

Project Area
Road
State Highway
County Road
Private Road
National Forest Land
Other Ownership

0 0.125 0.25
Miles
5/5/2015

Insufficient Habitat/Not Remapped


24
19
20
30
29
25
PLA0015
14 N 13 E
13 N 14 E
31
32
PLA0109
King Fire
Restoration
Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District
Spotted Owl PAC - PLA0015
Pre-fire Spotted Owl PAC
Spotted Owl Territory Area
(1,128 meter radius circle)
Project Area
Road
State Highway
County Road
Private Road
National Forest Land
Other Ownership
0 0.125 0.25
Miles
5/5/2015
Insufficient Habitat/Not Remapped



King Fire Restoration

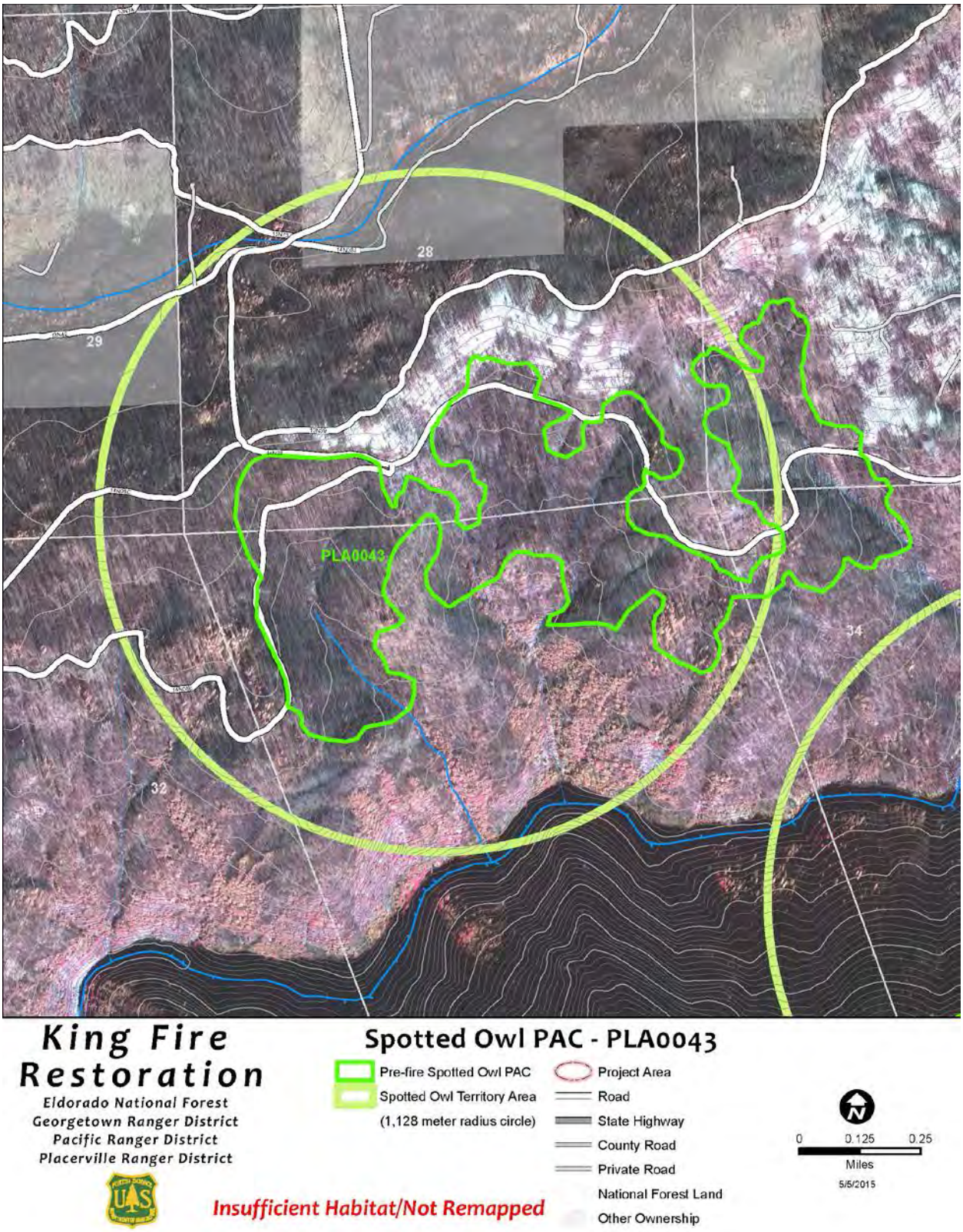
Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District

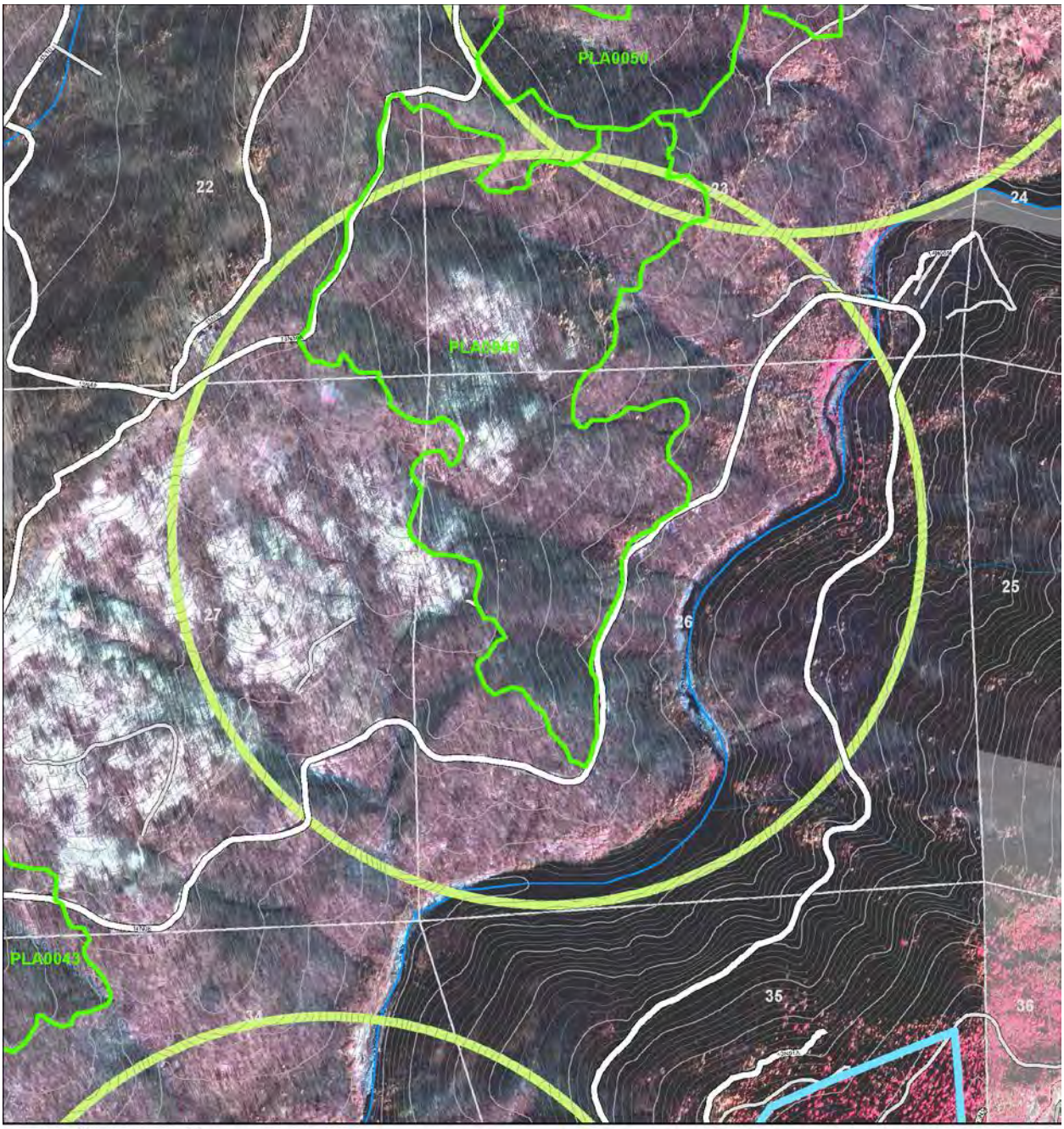
Spotted Owl PAC - PLA0038 & PLA0080

- Pre-fire Spotted Owl PAC
- Remapped Post-fire Spotted Owl PAC
- Spotted Owl Territory Area (1,128 meter radius circle)
- Project Area
- Road
- State Highway
- County Road
- Private Road
- National Forest Land
- Other Ownership

0 0.125 0.25 Miles

5/5/2015


28
29
PLA0043
34
32
King Fire
Restoration
Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District
Spotted Owl PAC - PLA0043
Pre-fire Spotted Owl PAC
Spotted Owl Territory Area
(1,128 meter radius circle)
Project Area
Road
State Highway
County Road
Private Road
National Forest Land
Other Ownership
0 0.125 0.25
Miles
5/5/2015
Insufficient Habitat/Not Remapped



King Fire Restoration

Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District

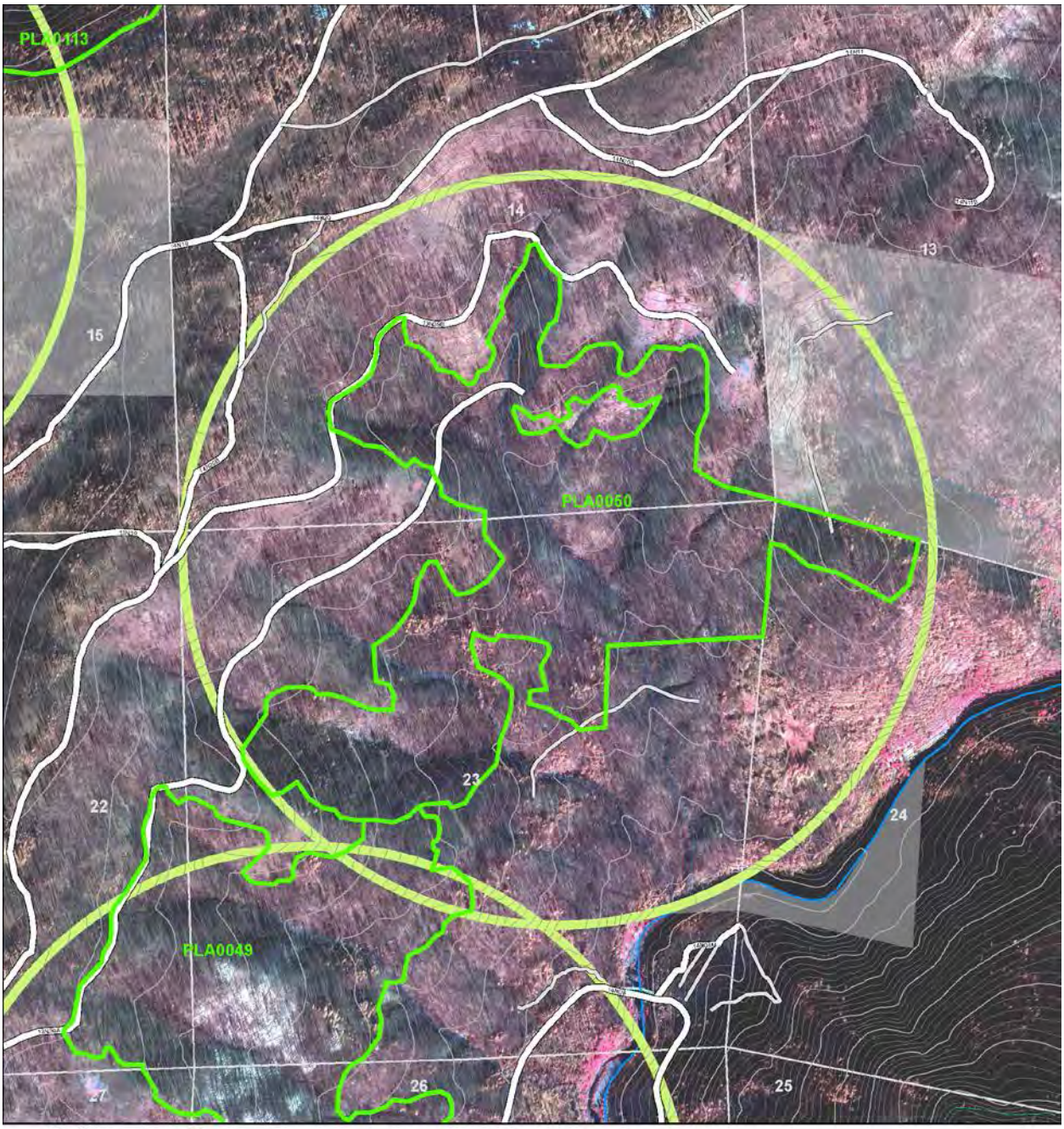
Spotted Owl PAC - PLA0049

Pre-fire Spotted Owl PAC
Remapped Post-fire Spotted Owl PAC
Spotted Owl Territory Area
(1,128 meter radius circle)

Project Area
Road
State Highway
County Road
Private Road
National Forest Land
Other Ownership

0 0.125 0.25
Miles
5/5/2015

Insufficient Habitat/Not Remapped



King Fire Restoration

Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District

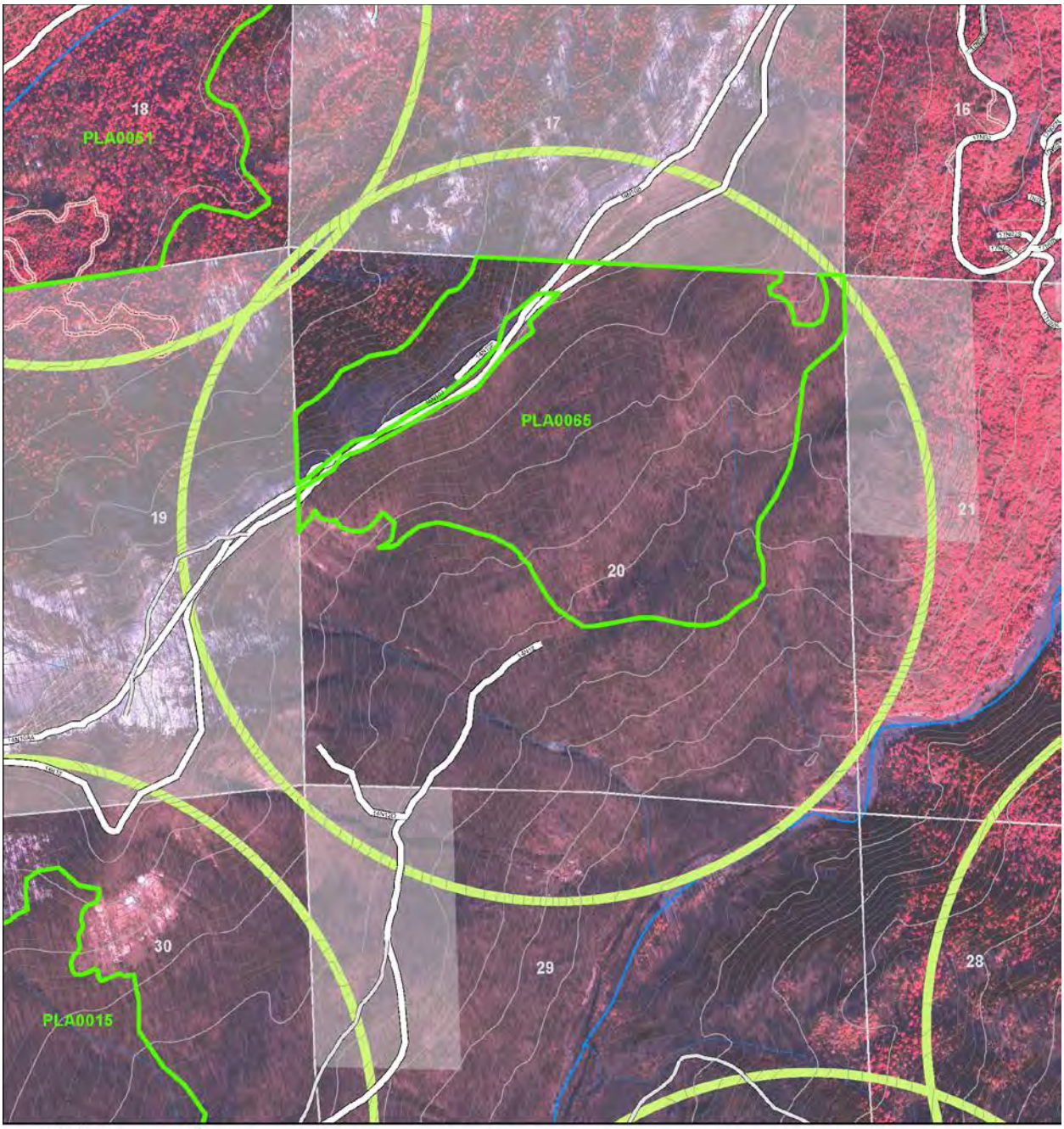
Spotted Owl PAC - PLA0050

Pre-fire Spotted Owl PAC
Spotted Owl Territory Area
(1,128 meter radius circle)

Project Area
Road
State Highway
County Road
Private Road
National Forest Land
Other Ownership

0 0.125 0.25
Miles
5/5/2015

Insufficient Habitat/Not Remapped



King Fire Restoration

Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District

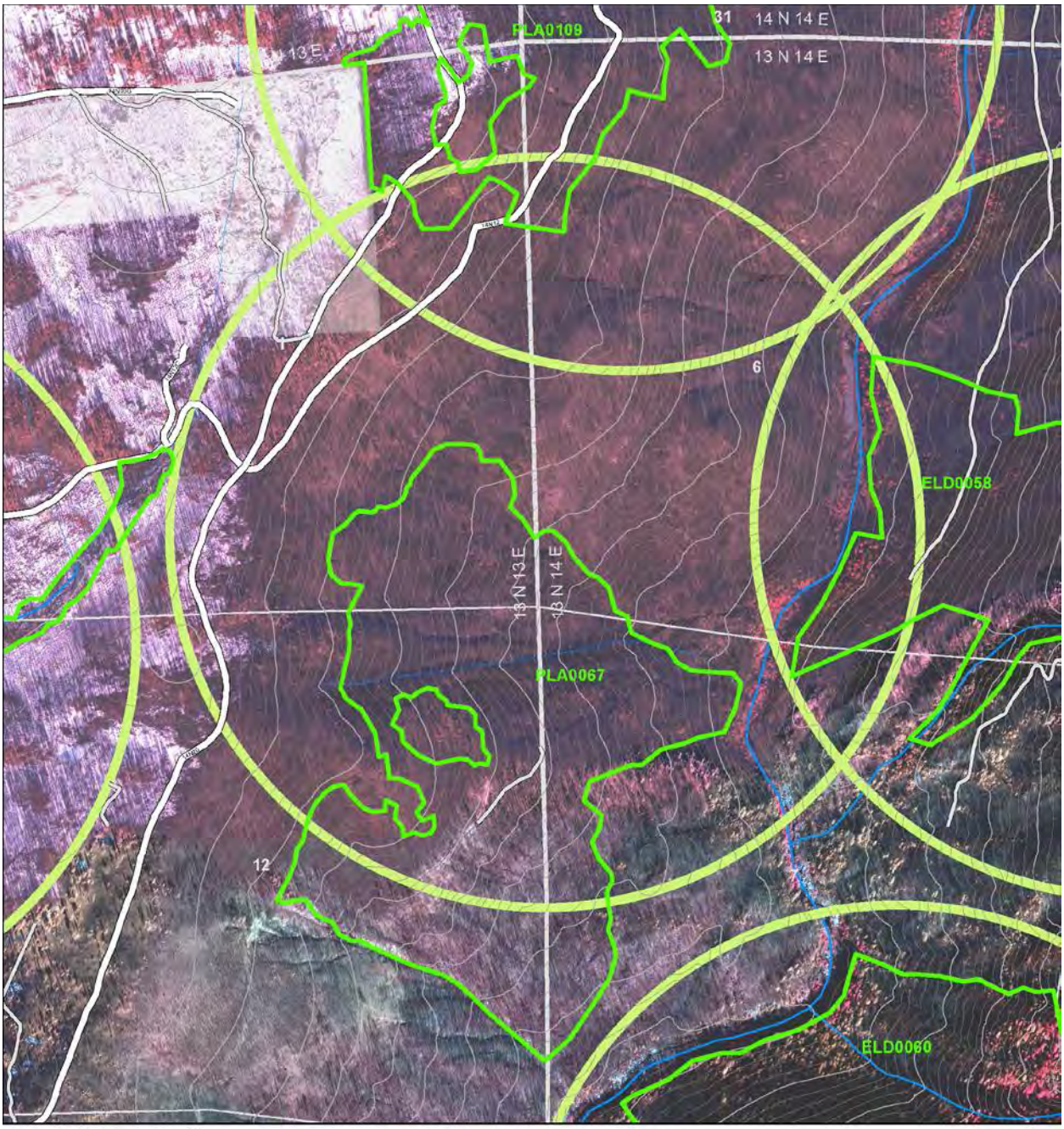
Spotted Owl PAC - PLA0065

Pre-fire Spotted Owl PAC
Spotted Owl Territory Area
(1,128 meter radius circle)

Project Area
Road
State Highway
County Road
Private Road
National Forest Land
Other Ownership

0 0.125 0.25
Miles
5/5/2015

Insufficient Habitat/Not Remapped



King Fire Restoration

Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District

Spotted Owl PAC - PLA0067

- Pre-fire Spotted Owl PAC
- Spotted Owl Territory Area (1,128 meter radius circle)
- Project Area
- Road
- State Highway
- County Road
- Private Road
- National Forest Land
- Other Ownership

0 0.125 0.25
Miles
5/5/2015

Insufficient Habitat/Not Remapped

King Fire Restoration

Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District

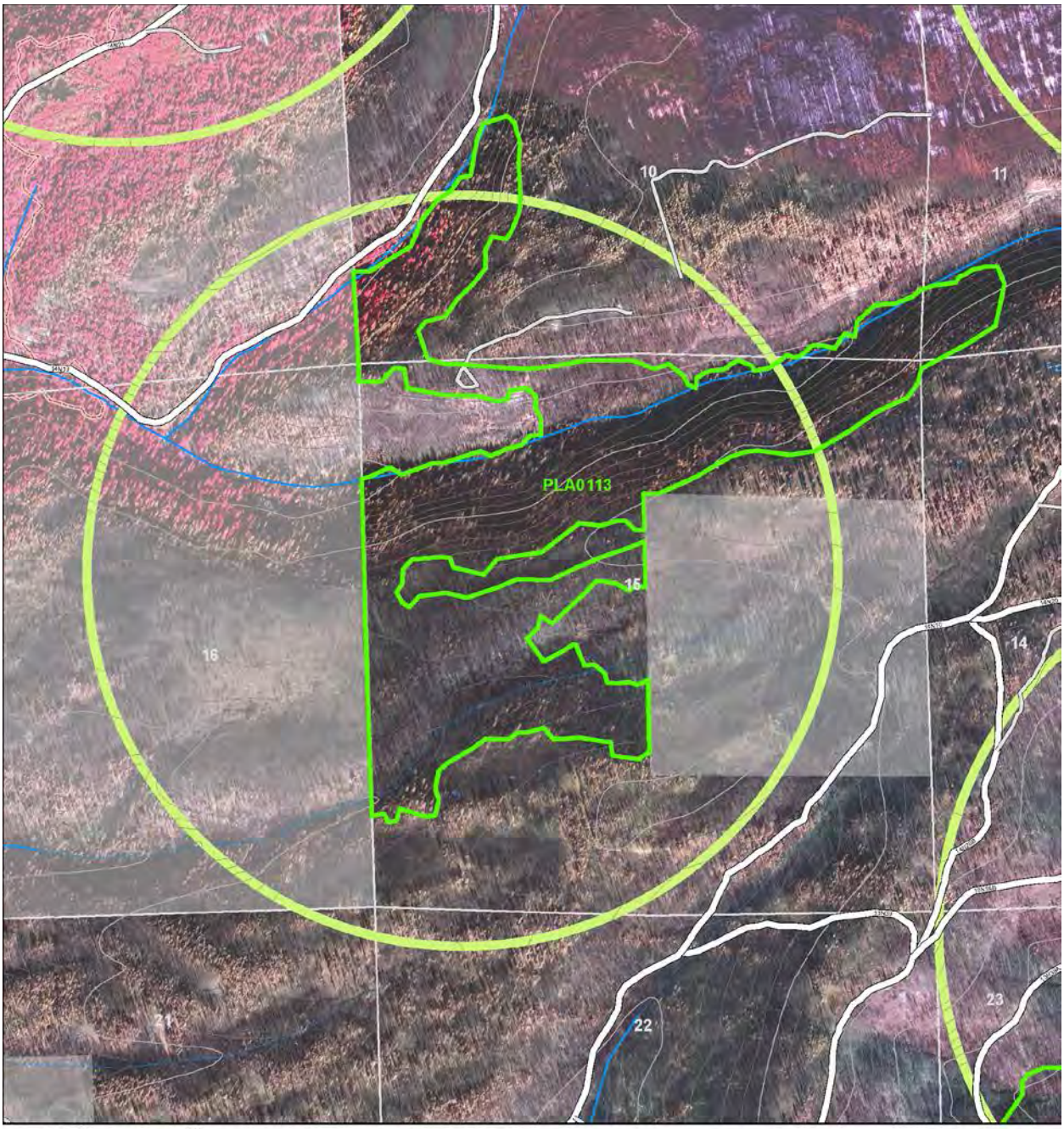
Spotted Owl PAC - PLA0109

Pre-fire Spotted Owl PAC
Spotted Owl Territory Area
(1,128 meter radius circle)

Project Area
Road
State Highway
County Road
Private Road
National Forest Land
Other Ownership

0 0.125 0.25
Miles
5/5/2015

Insufficient Habitat/Not Remapped



King Fire Restoration

Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District

Spotted Owl PAC - PLA0113

Pre-fire Spotted Owl PAC
Spotted Owl Territory Area
(1,128 meter radius circle)

Project Area
Road
State Highway
County Road
Private Road
National Forest Land
Other Ownership

0 0.125 0.25
Miles
5/5/2015

Insufficient Habitat/Not Remapped

Appendix F: Best Management Practices

Table 6 – Region 5 Best Management Practices

In the following table, design criteria are coded as:

RCA Riparian Conservation Areas
AR Aquatic Resources
WS Watershed
WSA Watershed Sensitive Areas
TSC Timber Sale Contract (provisions listed herein apply to corresponding provisions in stewardship contracts)
FSH Forest Service Handbook
FP-03 Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects

BMP Number	BMP Practice	BMP Objective	Project BMPs
12.12 Timber Management Best Management Practices			
1-1	Timber Sale Planning Process	To incorporate water quality and hydrologic considerations into the TSPP.	EIS Design Criteria: ▪ RCAs: 1 ▪ AR-6, 11, 13, 21 ▪ WS-1 through 7, and 9 through 12 TSC FSH 2409.13, Chap. 21-41 R-5 FSH 2409.26, Section 13 WSA development
1-2	Timber Harvest Unit Design	To ensure that timber harvest unit design will secure favorable conditions of water quality and quantity while maintaining desirable stream channel characteristics and watershed conditions. The design should consider the size and distribution of natural structures (snag and down logs) as a means of preventing erosion and sedimentation.	TSC Prov. C6.6 – R5 TSC Prov. C6.5 – R5 R5 Soil Quality Standards WSA development
1-3	Determination of Surface Erosion Hazard for Timber Harvest Unit Design	To identify high erosion hazard areas in order to adjust treatment measures to prevent downstream water quality degradation.	EHR analysis: Soil Section WSA development
1-4	Use of Sale Area Maps (SAM) and/or Project Maps for Designating Water Quality Protection Needs	To ensure recognition and protection of areas related to water quality protection delineated on a SAM or Project Map.	TSC Prov. B1.1 TSC Prov. B6.5 TSC Prov. B6.6 TSC Prov. C6.5 TSC Prov. C6.6

BMP Number	BMP Practice	BMP Objective	Project BMPs
1-5	Limiting the Operating Period of Timber Sale Activities	To ensure that the purchasers conduct their operations, including erosion control work, road maintenance, and so forth, in a timely manner, within the time specified in the Timber Sale Contract.	TSC Prov. B6.3 TSC Prov. B6.311 TSC Prov. B6.31 TSC Prov. B6.6 TSC Prov. B6.65 TSC Prov. B6.66 TSC Prov. C6.315 – R5
1-6	Protection of Unstable Lands	To provide special treatment of unstable areas to avoid triggering mass slope failure with resultant erosion and sedimentation. Minimum 50 feet Avoid headwall swale areas Avoid concave slopes Tighten up water bars Minimize surficial erosion Drain away from headwalls	Unstable areas were identified using LiDAR and flagged. The most unstable areas were identified as WSA to minimize erosion. Treatments in general include keeping skid trails 50 feet from flagged areas, drain skid trails away from flagged areas where feasible, and avoiding headwall swale areas.
1-7	Prescribing the Size and Shape of Regeneration Harvest Units	To control the physical size and shape of regeneration harvest units as a means of preventing erosion and sedimentation.	N/A: There are no regeneration harvest units.
1-8	Streamside Management Zone Designation	To designate a zone along riparian areas, streams, and wetlands that will minimize potential for adverse effects from adjacent management activities. Management activities within these zones are designed to improve riparian values.	EIS Design Criteria: ▪ RCAs: 1 ▪ AR-6, 11, 13, 21 ▪ WS-1 through 7, and 9 through 12 ▪ AR-13 TSC Prov. B6.5 TSC Prov. C6.5 – R5 R5 FSH 2409.26 Sec. 12 and 13 R5 FSH 2409.15, Sec. 61.41
1-9	Determining Tractor Loggable Ground	To minimize erosion and sedimentation resulting from ground disturbance of tractor logging systems.	Slope limitations and buffers FSH 2509.15 Soil Section
1-10	Tractor Skidding Design	By designing skidding patterns to best fit the terrain, the volume, velocity, concentration, and direction of runoff, water can be controlled in a manner that will minimize erosion and sedimentation.	EIS Design Criteria: ▪ RCAs: 1 ▪ WS-2 and 9. Existing disturbances were identified using LiDAR.

BMP Number	BMP Practice	BMP Objective	Project BMPs
1-11	Suspended Log Yarding in Timber Harvesting	1. To protect the soil mantle from excessive disturbance. 2. To maintain the integrity of the SMZ and other sensitive watershed areas. 3. To control erosion on cable corridors.	R-5 FSH 2409.15 Sec. 61 TSC Prov. B6.42 TSC Prov. C6.425 TSC Prov. C6.429
1-12	Log Landing Location	To locate new landings or reuse old landings in such a way as to avoid watershed impacts and associated water quality degradation.	R-5 FSH 2409.15 Sec. 61 EIS Design Criteria: ▪ RCAs: 1 ▪ WS-9 TSC Prov. B6.422 TSC Prov. C6.428 TSC Prov. C6.6
1-13	Erosion Prevention and Control Measures During Timber Sale Operations	To ensure that the purchasers' operations will be conducted reasonably to minimize soil erosion.	R-5 FSH 2409.15 Sec. 61 TSC Prov. B6.3 TSC Prov. B6.6 TSC Prov. C6.6 – R5
1-14	Special Erosion-prevention Measures on Disturbed Land	To provide appropriate erosion and sedimentation protection for disturbed areas.	EIS Design Criteria: ▪ WS-3, 4, 6, 7, 8, 9, 11, and 12 ▪ Development of WSAs R-5 FSH 2409.15 Sec. 61 FSH 2509.11 TSC Prov. B6.6 TSC Prov. C6.6 – R5
1-15	Revegetation of Areas Disturbed by Harvest Activities	To establish a vegetative ground cover on disturbed sites to prevent erosion and sedimentation.	BMP 2-13: An erosion control plan will be developed prior to implementation.
1-16	Log Landing Erosion Control	To reduce the impacts of erosion and subsequent sedimentation associated with log landings by use of mitigating measures.	R-5 FSH 2409.15 Sec. 61 TSC Prov. B6.422 TSC Prov. B6.64 TSC Prov. B6.6 TSC Prov. B6.67 TSC Prov. C6.428 TSC Prov. C6.6 - R5
1-17	Erosion Control on Skid Trails	To protect water quality by minimizing erosion and sedimentation derived from skid trails.	EIS Design Criteria: ▪ RCA-1 ▪ WS-2, 3, and 9 R-5 FSH 2409.15 Sec. 61 TSC Prov. B6.6 TSC Prov. B6.65 TSC Prov. B6.66 TSC Prov. C6.6 - R5

BMP Number	BMP Practice	BMP Objective	Project BMPs
1-18	Meadow Protection During Timber Harvesting	To avoid damage to the ground cover, soil, and the hydrologic function of meadows.	N/A: No activities will occur in identified meadows and fens.
1-19	Streamcourse and Aquatic Protection	1. To conduct management actions within these areas in a manner that maintains or improves riparian and aquatic values. 2. To provide unobstructed passage of storm flows. 3. To control sediment and other pollutants entering stream courses. 4. To restore the natural course of any stream as soon as practicable, where diversion of the stream has resulted from timber management activities.	EIS Design Criteria: ▪ Development of WSAs ▪ RCA-1 ▪ AR-2, 6, 9, 10, 11 and 13 ▪ WS 1, 3, 4, 6, 11, and 12 R-5 FSH 2409.15 Sec. 51, 61 R-5 FSH 2409.26, Sec. 13 R-5 FSH 2509.22, Chap. 30 TSC Prov. B6.34 TSC Prov. B6.341 TSC Prov. B6.342 TSC Prov. B6.5 TSC Prov. B6.6 TSC Prov. C6.5 TSC Prov. C6.6
1-20	Erosion Control Structure Maintenance	To ensure that constructed erosion control structures are stabilized and working.	TSC Prov. B4.225 TSC Prov. B6.6 TSC Prov. B6.66 TSC Prov. B6.67
1-21	Acceptance of Timber Sale Erosion Control Measures Before Sale Closure	To ensure the adequacy of required erosion control work on timber sales.	R-5 FSH 2409.15 Sec. 61 TSC Prov. B6.36 TSC Prov. B6.6 TSC Prov. B6.63 TSC Prov. B6.64 TSC Prov. B6.65 TSC Prov. B6.66 TSC Prov. B9.5 TSC Prov. C6.6 – R5
1-22	Slash Treatment in Sensitive Areas	To maintain or improve water quality by protecting sensitive areas from degradation which would likely result from using mechanized equipment for slash disposal.	R5 FSH 2409.15 Sec. 61 TSC Prov. C6.7 – R5
1-23	Five-Year Reforestation Requirement	To assure a continuous forest cover and to limit disturbance on areas with limited regeneration potential where there is no assurance that the site can be reforested within the timeframe.	EIS: Reforestation proposal FSH 2409.13, Chap. 21 and 42 FSH 2409.26, Sec. 12 & 13 FSM 2470.3

BMP Number	BMP Practice	BMP Objective	Project BMPs
1-24	Non-recurring "C" Provisions that can be used for Water Quality Protection	To use the option of inserting Special "C" provisions in the timber sale contract to protect water quality where standard "B" or "C" provisions do not apply or are inadequate to protect watershed values.	None identified as needed at this time.
1-25	Modification of the Timber Sale Contract	To modify the TSC if new circumstances, or conditions indicate that the timber sale will damage soil, water, or watershed values.	TSC Prov. B8.3 TSC Prov. B8.31 TSC Prov. B8.33 FSH 2409.15, Sec. 33
12.22 Road and Building Site Construction Best Management Practices			
2-1	Travel Management Planning and Analysis	Roads impact water quality to varying degrees. Use the travel analysis and road management planning processes to develop measures to avoid, minimize, and mitigate adverse impacts to water, aquatic, and riparian resources during road management activities, contribute toward restoration of water quality where needed, and identify the road system which can be effectively maintained.	During field surveys, roads causing environmental degradation were identified. A Transportation Analysis for this project will be completed as part of the Transportation Report. A review and design of roads for installation and repair of water drainage features, culvert replacement and cleaning and road resurfacing activities is completed as part of the road engineering package and will be included in the Timber Sale Contract.
2-2	General Guidelines for the Location and Design of Roads	Locate roads to minimize problems and risks to water, aquatic, and riparian resources. Incorporate measures that prevent or reduce impacts, through design for construction, reconstruction, and other route system improvements.	No new permanent roads are proposed. Road Reconstruction/repair: FP-03 Special Project Specifications TSC: Prov. B5.211; Drawings TSC Prov. B5.1 TSC Prov. B5.12 TSC Prov. B5.2 Temporary Roads: TSC Prov. B5.1 TSC Prov. B6.63 TSC Prov. B6.631

BMP Number	BMP Practice	BMP Objective	Project BMPs
2-3	Road Construction and Reconstruction	Minimize erosion and sediment delivery from roads during road construction or reconstruction and their related activities.	Erosion Control Plan (not yet completed) FP-03 Special Project Specifications TSC: Prov. B5.211; Drawings TSC Prov. B6.6 TSC Prov. B6.63 TSC Prov. B6.66 TSC Prov. B6.67 TSC Prov. C6.6 – R5
2-4	Road Maintenance and Operations	To ensure water quality protection by providing adequate and appropriate maintenance and by controlling road use and operations.	Timber Sale Road Maintenance Specifications EIS Proposed Action ▪ Roads TSC Prov. B5.3 TSC Prov. C5.31
2-5	Water Source Development and Utilization	To supply water for road construction, maintenance, dust abatement, fire protection, and other management activities, while protecting and maintaining water quality.	Water sources were evaluated by an aquatics biologist for this project. EIS Design Criteria: ▪ AR-17 through 21 FP-03 Special Project Specifications TSC: Prov. B5.211; Drawings TSC Prov. C5.31 TSC Prov. C5.35 – R5
2-6	Road Storage	Ensure that roads placed in storage are maintained to so that drainage facilities and runoff patterns function properly, and damage to adjacent resources is prevented. Stored roads are managed to be returned to service, at various intervals.	FSM 7720 FSH 7709.56, Chap. 10 FP-03

BMP Number	BMP Practice	BMP Objective	Project BMPs
2-7	Road Decommissioning	Stabilize, restore, and vegetate unneeded roads to a more natural state as necessary to protect and enhance NFS lands, resources, and water quality. The end result is that the decommissioned road will not represent a significant impact to water quality by: 1. reducing erosion from road surfaces and slopes and related sedimentation of streams; 2. reducing risk of mass failures and subsequent impact on water quality; 3. restoring natural surface and subsurface drainage patterns; and 4. restoring stream channels at road crossings and where roads run adjacent to	No roads are proposed for decommissioning; however, identification and stabilization of priority disturbances are planned EIS Proposed Action ▪ Watershed Sensitive Areas EIS Design Criteria: ▪ WS-3, 4, 6, 7 and 9
2-8	Stream Crossings	Minimize water, aquatic, and riparian resource disturbances and related sediment production when constructing, reconstructing, or maintaining temporary and permanent water crossings.	FSH 2409.15 Sec. 51, 61 EIS Design Criteria ▪ AR-2 and 6 Timber Sale Road Maintenance Specifications Standard Specifications for Roads and Bridges Special Project Specifications TSC: Prov. B5.211; Drawings TSC Prov. B6.5 TSC Prov. B6.6 TSC Prov. B6.63 TSC Prov. B6.66 TSC Prov. B5.3 TSC Prov. C5.31 TSC Prov. C6.5 – R5 TSC Prov. C6.6 – R5
2-9	Snow Removal and Storage	Prevent or reduce erosion, sedimentation, and chemical pollution that may result from snow removal and storage activities.	Timber Sale Road Maintenance Specifications TSC Prov. B5.31 TSC Prov. B5.35 – R5
2-10	Parking and Staging Areas	Construct, install, and maintain an appropriate level of drainage and runoff treatment for parking and staging areas to protect water, aquatic, and riparian resources.	FSH 2409.15 Sec. 61 Typically landings. Refer to BMP 1-16

BMP Number	BMP Practice	BMP Objective	Project BMPs
2-11	Equipment Refueling and Servicing	Prevent fuels, lubricants, cleaners, and other harmful materials from discharging into nearby surface waters or infiltrating through soils to contaminate groundwater resources.	TSC Prov. B6.34 TSC Prov. B6.341 TSC Prov. B6.342
2-12	Aggregate Borrow Areas	Minimize disturbance to water, aquatic, and riparian resources when developing and using aggregate borrow sites.	N/A: No borrow pits will be used in the project area.
2-13	Erosion Control Plan	Effectively limit and mitigate erosion and sedimentation from any ground-disturbing activities, through planning prior to commencement of project activity, and through project management and administration during project implementation.	Erosion Control Plan will be developed prior to commencement of project. Wet Weather Project Plan developed and agreed to prior to operations outside normal operating season
12.31 Mining BMPs			No Mining Best Management Practices apply to this Project
12.41 Recreation BMPs			No Recreation Best Management Practices apply to this project
12.52 Vegetation Manipulation Best Management Practices			
5-1	Soil-disturbing Treatments on the Contour	To decrease sediment production and stream turbidity, while mechanically treating slopes.	EIS Design Criteria: ▪ WS: 1 through 7, 9 through 12
5-2	Slope Limitations for Mechanical Equipment Operation	To reduce gully and sheet erosion and associated sediment production by limiting tractor use.	EIS Proposed Action: ▪ WSA development EIS Design Criteria: ▪ WS-5 TSC Prov. C6.42 Stewardship project specifications; IRTC Prov. K-G.9
5-3	Tractor Operation Limitation in Wetlands and Meadows	To limit turbidity and sediment production resulting from compaction, rutting, runoff concentration, and subsequent erosion by excluding the use of mechanical equipment in wetland and meadows except for the purpose of restoring wetland and meadow function.	N/A: No activities are planned within wetlands or meadows Meadows are identified on contract map for avoidance/ protection; TSC Prov. B6.61

BMP Number	BMP Practice	BMP Objective	Project BMPs
5-4	Revegetation of Surface-disturbed Areas	To protect water quality by minimizing soil erosion through the stabilizing influence of vegetation foliage and root network.	EIS Proposed Action ▪ WSA development TSC Prov. C6.6 – R5
5-5	Disposal of Organic Debris	To prevent gully and surface erosion with associated reduction in sediment production and turbidity during and after treatment.	EIS Purpose and Need to reduce the risk to soils in future fires. EIS Proposed Action ▪ WSA development EIS Design Criteria: ▪ WS-1-12
5-6	Soil Moisture Limitations for Mechanical Equipment Operations	To prevent compaction, rutting, and gullying, with resultant sediment production and turbidity.	Wet Weather Project Plan developed and agreed to prior to operations outside normal operating season TSC Prov. B6.31 TSC Prov. B6.6 TSC Prov. B6.66 TSC Prov. C6.6 – R5
5-7	Pesticide Use Planning Process	To introduce water quality and hydrologic considerations into the pesticide use planning process.	EIS Design Criteria: ▪ AR-9 through 11
5-8	Pesticide Application According to Label Directions and Applicable Legal Requirements	To avoid water contamination by complying with all label instructions and restrictions for use.	FSM 2150 and FSH 2109.14 EIS Human Health and Safety Risk Assessment in project file and Chapter 3 of EIS Applications method described in EIS
5-9	Pesticide Application Monitoring and Evaluation	1. To determine whether pesticides have been applied safely, restricted to intended target areas, and have not resulted in unexpected non-target effects. 2. To document and provide early warning of possible hazardous conditions resulting from possible contamination of water or other non-target areas by pesticides. 3. To determine the extent, severity, and possible duration of any potential hazard that might exist.	FSH 2109.14

BMP Number	BMP Practice	BMP Objective	Project BMPs
5-10	Pesticide Spill Contingency Planning	To reduce contamination of water by accidental pesticide spills.	FSH 2109.14
5-11	Cleaning and Disposal of Pesticide Containers and Equipment	To prevent water contamination resulting from cleaning, or disposal of pesticide containers.	FSH 2109.14 (40)
5-12	Streamside Wet Area Protection During Pesticide Spraying	To minimize the risk of pesticide inadvertently entering waters, or unintentionally altering the riparian area, SMZ, or wetland.	EIS Design Criteria: ▪ AR-9 through 11
5-13	Controlling Pesticide Drift During Spray Application	To minimize the risk of pesticide falling directly into water, or non-target areas.	FSH 2109.14
12.62 Fire Suppression and Fuels Best Management Practices			
6-1	Fire and Fuels Management Activities	To reduce public and private losses and environmental impacts which result from wildfires and/or subsequent flooding and erosion by reducing or managing the frequency, intensity, and extent of wildfire.	EIS Purpose and Need
6-2	Consideration of Water Quality in Formulating Fire Prescriptions	To provide for water quality protection while achieving the management objectives through the use of prescribed fire.	EIS Design Criteria: ▪ AR-13 ▪ WS-10
6-3	Protection of Water Quality from Prescribed Burning Effects	To maintain soil productivity, minimize erosion, and minimize ash, sediment, nutrients, and debris from entering water bodies.	EIS Design Criteria: ▪ AR-13 ▪ WS-10
6-4	Minimizing Watershed Damage from Fire Suppression Efforts	To avoid watershed damage in excess of that already caused by the wildfire.	N/A
6-5	Repair or Stabilization of Fire Suppression-related Watershed Damage	To stabilize all areas that have had their erosion potential significantly increased, or their drainage pattern altered by suppression-related activities.	N/A

BMP Number	BMP Practice	BMP Objective	Project BMPs
6-6	Emergency Rehabilitation of Watersheds Following Wildfires	Objective: To minimize as far as practicable: a. loss of soil and onsite productivity; b. overland flow, channel obstruction, and instability; and c. threats to life and property, both onsite and offsite.	N/A
12.72 Watershed Management Best Management Practices			
7-1	Watershed Restoration	To repair degraded watershed conditions, and improve water quality and soil	EIS Proposed Action: ▪ WSA development includes limited watershed restoration.
7-2	Conduct Floodplain Hazard Analysis and Evaluation	To avoid, where possible, the long- and short-term adverse impacts to water quality associated with the occupancy and modification of floodplains.	N/A: No activities are proposed within floodplains
7-3	Protection of Wetlands	To avoid adverse water-quality impacts associated with destruction, disturbance, or modification of wetlands.	N/A: Implementation of activities are not planned in wetlands.
7-4	Forest and Hazardous Substance Spill Prevention Control and Countermeasure (SPCC) Plan	To prevent contamination of waters from accidental spills.	An annual spill plan is maintained for project implementation reference and planning. The SPCC Plan is developed and maintained at the Forest level and is tiered to in the annual spill plan. TSC Prov. B6.341
7-5	Control of Activities under Special Use Permit	To protect surface and subsurface water quality from physical, chemical, and biological pollutants resulting from activities that are under special use permit.	N/A
7-6	Water Quality Monitoring	To collect representative water data to determine baseline conditions for comparison to established water quality standards that are related to beneficial uses for that particular watershed.	EIS Watershed Monitoring Plan

BMP Number	BMP Practice	BMP Objective	Project BMPs
7-7	Management by Closure to Use (Seasonal, Temporary, and Permanent)	To exclude activities that could result in damages to either resources or improvements, such as roads and trails, resulting in impaired water quality.	Seasonal Forest Closure Order Gates installed per Road Plans/Drawings on applicable Maintenance Level 1 Roads EIS Design Criteria: WS-8
7-8	Cumulative Offsite Watershed Effects	To protect the identified beneficial uses of water from the combined effects of multiple management activities which individually may not create unacceptable effects but collectively may result in degraded water quality conditions.	EIS: Cumulative Watershed Effects analysis
12.81 Range Management BMPs			No Range Management BMPs are necessary for this project

Table 7 – National Best Management Practices Applicable To and Used in Project Planning and Design

BMP	Objective	Compliance
Plan-1. Forest and Grassland Planning	Use the land management planning and decision-making processes to incorporate direction for water quality management consistent with laws, regulation, and policy into land management plans.	Applicable to Land Management Plan. Direction from the Land Management Plan is tiered in project planning and through Regional BMPs.
Plan-2. Project Planning and Analysis	Use the project planning, environmental analysis, and decision-making processes to incorporate water quality management BMPs into project design and implementation.	Interdisciplinary Team project planning and effects analysis. Analysis of Riparian Conservation Objectives (RCO). Regional BMPs (12.12 1-1; 12.22 2-1 and 2-13; 12.52 5-7)
Plan-3. Aquatic Management Zone Planning	To maintain and improve or restore the condition of land around and adjacent to waterbodies in the context of the environment in which they are located, recognizing their unique values and importance to water quality while implementing land and resource management activities.	RCO analysis and Interdisciplinary Team development of proposed action items for improvement of aquatic ecosystems including reduced fire hazard and transportation improvements. Regional BMP 12.12 1-19.
AqEco-1. Aquatic Ecosystem Improvement and Restoration Planning	Reestablish and retain ecological resilience of aquatic ecosystems and associated resources to achieve sustainability and provide a broad range of ecosystem services.	Identification of project activities such as transportation improvements and rehab of areas to improve hydrologic and aquatic functioning. RCO planning and analysis process.
AqEco-2. Operations in Aquatic Ecosystems	Avoid, minimize, or mitigate adverse impacts to water quality when working in aquatic ecosystems.	RCO analysis and Interdisciplinary team development of design criteria to protect aquatic ecosystems. Regional BMP 12.12 1-19.
AqEco-3. Ponds and Wetlands	Design and implement pond and wetlands projects in a manner that increases the potential for success in meeting project objectives and avoids, minimizes, or mitigates adverse effects to soil, water quality, and riparian resources	Wetland improvements will occur as part of this project; however, this BMP will be addressed with specific designs (WSAs)
AqEco-4. Stream Channels and Shorelines	Design and implement stream channel and lake shoreline projects in a manner that increases the potential for success in meeting project objectives and avoids, minimizes, or mitigates adverse effects to soil, water quality, and riparian resources.	Channel projects will occur as part of this project; however, this BMP will be addressed with specific designs.

BMP	Objective	Compliance
Chem-1. Chemical Use Planning	Use the planning process to develop measures to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources from chemical use on NFS lands.	RCO and ID Team involvement in action and design criteria development including nozzle requirements, buffer widths, and chemicals proposed. Project conformance with local, State, Federal, and agency policies, regulations, and laws through compliance with Regional BMP 12.52 5-9 and project design elements.
Chem-2. Follow Label Directions	Avoid or minimize the risk of soil and surface water or groundwater contamination by complying with all label instructions and restrictions required for legal use.	Compliance with label requirements is built into compliance with Regional BMP 12.52 5-8 and project design.
Chem-3. Chemical Use Near Waterbodies	Avoid or minimize the risk of chemical delivery to surface water or groundwater when treating areas near waterbodies.	Proximity of application, mixing and storage of chemicals near waterbodies and identification of these areas evaluated and incorporated into the RCO and design criteria. Operation during weather conditions that could increase risk to aquatic and hydrologic resources have be restricted. Regional BMPs 12.52 5-10, and 5-12
Chem-4. Chemical Use in Waterbodies	Avoid, minimize, or mitigate unintended adverse effects to water quality from chemical treatments applied directly to waterbodies.	N/A. Waterbodies are not proposed for treatment under this project.
Chem-5. Chemical Handling and Disposal	Avoid or minimize water and soil contamination when transporting, storing, preparing and mixing chemicals; cleaning application equipment; and cleaning or disposing chemical containers.	Chemical handling and disposal is incorporated in this project through Regional BMP 5-11 compliance and FSH and FSM compliance.
Chem-6. Chemical Application Monitoring and Evaluation	1. Determine whether chemicals have been applied safely, have been restricted to intended targets, and have not resulted in unexpected non-target effects. 2. Document and provide early warning of possible hazardous conditions resulting from potential contamination of water or other non-target resources or areas by chemicals.	Monitoring of compliance and safety have been addressed in the design criteria and monitoring elements of the project. Regional BMP 5-9.

BMP	Objective	Compliance
Facilities and Non-recreation Special Uses BMPs (FAC 1-10)	The purpose of this set of BMPs is to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources that may result from development, use, maintenance, and reclamation of facilities located on National Forest System lands.	N/A. Facility use and Special Uses are not included in this project.
Fire-1. Wildland Fire Management Planning	Use the fire management planning process to develop measures to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during wildland fire management activities.	N/A. Wildland fire management is not a part of this project.
Fire-2. Use of Prescribed Fire	Avoid, minimize, or mitigate adverse effects of prescribed fire and associated activities on soil, water quality, and riparian resources that may result from excessive soil disturbance, as well as inputs of ash, sediment, nutrients, and debris.	Design criteria and project design features including compliance with Regional BMPs 12.62 6-1, 6-2, and 6-3 has been developed to minimize potential for negative effects resulting from prescribed fire implementation.
Fire-3. Wildland Fire Control and Suppression	Avoid or minimize adverse effects to soil, water quality, and riparian resources during fire control and suppression efforts.	Not directly applicable to this project; however, with implementation of this project, potential for adverse effects from control and suppression of wildfire would be reduced.
Fire-4. Wildland Fire Suppression Damage Rehabilitation	Rehabilitate watershed features and functions damaged by wildland fire control and suppression-related activities to avoid, minimize, or mitigate long-term adverse effects to soil, water quality, and riparian resources	N/A. Not a fire rehabilitation project.
Minerals Management Activities (Min-1-8)	The purpose of this set of BMPs is to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources that may result from various mineral exploration, development, operation, and reclamation activities.	N/A. Mineral management is not included in this project.
Rangeland Management Activities (Range-1-3)	The purpose of this set of BMPs is to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources that may result from rangeland management activities.	N/A. Rangeland management is not included in this project

BMP	Objective	Compliance
Recreation Management Activities (Rec-1-2 and 4-12)	The purpose of this set of BMPs is to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources that may result from recreation activities.	N/A. Recreation management is not included in this project except to include EIS Design Criteria: WS-8 to discourage unauthorized OHV use.
Rec-3. Dispersed Use Recreation	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources by managing dispersed activities and undeveloped sites to maintain ground cover, maintain soil quality, control runoff, and provide needed sanitary facilities to minimize the discharge of nonpoint source pollutants and maintain streambank and riparian area integrity.	N/A. Control and rehabilitation of dispersed recreation sites is not included in proposed activities for this project except to include EIS Design Criteria: WS-8 to discourage unauthorized OHV use.
Road-1. Travel Management Planning and Analysis	Use the travel management planning and analysis processes to develop measures to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during road management activities.	Included in the NEPA ID Team analysis of the project.
Road-2. Road Location and Design	Locate and design roads to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources.	Design of roads was evaluated and planned as part of the ID Team process for project design. Regional BMP 12.22 2-1.
Road-3. Road Construction and Reconstruction	Avoid or minimize adverse effects to soil, water quality, and riparian resources from erosion, sediment, and other pollutant delivery during road construction or reconstruction.	Compliance with Regional BMP 2-3 and contract road package requirements.
Road-4. Road Operations and Maintenance	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources by controlling road use and operations and providing adequate and appropriate maintenance to minimize sediment production and other pollutants during the useful life of the road.	Regional BMP 12.22 2-3. Maintenance and appropriate use of roads used during the project is built into the timber sale and stewardship contracts.
Road-5. Temporary Roads	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources from the construction and use of temporary roads.	Temporary road construction, use, and management are dealt with through compliance with contract provisions for timber sale and stewardship projects and FSH 2409.15. Regional BMPs 12.22 2-2, and 2-8

BMP	Objective	Compliance
Road-6. Road Storage and Decommissioning	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources by storing closed roads not needed for at least one year (Intermittent Stored Service) and decommissioning unneeded roads in a hydrologically stable manner to eliminate hydrologic connectivity, restore natural flow patterns, and minimize soil erosion.	Compliance with Regional BMPs (12.22 2-6 and 2-7) and contract provisions for a timber sale or stewardship contract. Additionally, opportunities for road decommissioning were reviewed as part of the ID Team planning and project design process.
Road-7. Stream Crossings	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources when constructing, reconstructing, or maintaining temporary and permanent waterbody crossings.	ID Team project design and evaluation for road work activities, project design criteria, and compliance with Regional BMP 12.22 2-8.
Road-8. Snow Removal and Storage	Avoid or minimize erosion, sedimentation, and chemical pollution that may result from snow removal and storage activities.	Compliance with Regional BMP 12.22 2-9 and contract provisions for a timber sale or stewardship contract.
Road-9. Parking and Staging Areas	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources when constructing and maintaining parking and staging areas.	Compliance with Regional BMP 12.22 2-10. Parking and staging is usually connected to landing development and use, or is dealt with in road plans.
Road-10. Equipment Refueling and Servicing	Avoid or minimize adverse effects to soil, water quality, and riparian resources from fuels, lubricants, cleaners, and other harmful materials discharging into nearby surface waters or infiltrating through soils to contaminate groundwater resources during equipment refueling and servicing activities.	Compliance with Regional BMP 12.22 2-11 and project design features.
Road-11. Road Storm Damage Surveys	Monitor road conditions following storm events to detect road failures; assess damage or potential damage to waterbodies, riparian resources, and watershed functions; determine the causes of the failures; and identify potential remedial actions at the damaged sites and preventative actions at similar sites.	Monitoring would apply during project implementation until final acceptance of work items and contract and water quality waiver termination.
Veg-1. Vegetation Management Planning	Use the applicable vegetation management planning processes to develop measures to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during mechanical vegetation treatment activities.	ID Team planning process and compliance with Regional BMP 12.12 1-1.

BMP	Objective	Compliance
Veg-2. Erosion Prevention and Control	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources by implementing measures to control surface erosion, gully formation, mass slope failure, and resulting sediment movement before, during, and after mechanical vegetation treatments.	ID Team planning process and Regional BMPs 12.12 1-2, 1-3, 1-6, 1-9, 1-10, 1-12, 1-13, 1-14, 1-15, 1-16, 1-17, 1-20, 1-21; and 12.52 5-1, 5-2, 5-4, and 5-6.
Veg-3. Aquatic Management Zones	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources when conducting mechanical vegetation treatment activities in the AMZ.	RCO analysis and Regional BMPs 12.12 1-8, and 1-19; 12-52 5-3, and 5-12
Veg-4. Ground-Based Skidding and Yarding Operations	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during ground-based skidding and yarding operations by minimizing site disturbance and controlling the introduction of sediment, nutrients, and chemical pollutants to waterbodies.	Regional BMPs 12.12 1-9, 1-10, 1-11, 1-13, 1-17, and 1-20.
Veg-5. Cable and Aerial Yarding Operations	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during cable and aerial yarding operations by minimizing site disturbance and controlling the introduction of sediment, nutrients, and chemical pollutants to waterbodies.	ID Team planning process and evaluation was used to develop design criteria to minimize or mitigate potential adverse effects. Regional BMPs 12.12 and 12.52 FSH 2409.15.
Veg-6. Landings	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources from the construction and use of log landings.	Regional BMPs 12.12 1-12 and 1-16
Veg-7. Winter Logging	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources from winter logging activities.	Regional BMP 12.12 1-5 and 12.52 5-6
Veg-8. Mechanical Site Treatment	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources by controlling the introduction of sediment, nutrients, chemical, or other pollutants to waterbodies during mechanical site treatment.	National BMPs Veg-2 and Veg-3 and Regional BMPs 12.12 1-19 and 12.52 5-1, 5-2, 5-3, and 5-4.
Water Uses Management Activities	The purpose of this set of BMPs is to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources from development and operation of infrastructure to collect, impound, store, transmit, and distribute water for uses on and off National Forest System lands.	N/A. Not a part of this project.

APPENDIX G: General Principles for Snag Retention

(Based upon Sierra Nevada Post-Fire Habitat Recommendations, Point Blue Conservation Science)

- For retention purposes, snags are larger than 15 inches dbh and should be clumped and distributed irregularly across treatment units (SNFPAROD, pg. 52.)
- Generally, retention patches should be located more than 150 feet from other unsalvaged fire-killed trees.
- Snag retention patches will be identified as clumps of the largest, densest trees in the unit or will be anchored on a valuable habitat structure such as a pre-fire snag with cavities or very large fire-killed tree or anchored around pre-fire biological use areas such as nests/roosts and areas with records of high densities of breeding spotted owl and goshawk observations.
- Retention patches will be of varying sizes (generally 0.25 to 5 acres in size) distributed in an uneven mosaic within units (heterogeneity in patch size and distribution is desirable).
- Snags as small as 6 inches dbh are used by a number of avian species for foraging and nesting, and should be considered to have value in retention patches.
- Strive to retain very large trees even if outside of a patch, due to their longevity as snags and value as future wood in the developing forest. Individual snags that remain in areas being replanted will provide the only source of down wood in developing forests for decades to come and will increase the quality of both early-seral and young-forest habitat for wildlife.
- In larger salvage units snag retention patches can be larger and more widely spaced; in smaller or more narrow units smaller patches will be distributed more frequently through the unit.
- Consider GTR 220 principles when identifying size and distribution of snag retention patches by retaining larger, more widely spaced patches on north and east aspects, and more closely spaced patches on south and west aspects.
- Snag retention clumps should remain unplanted to provide a mosaic of complex early-seral forest and future uneven-age forest structure in developing stands.

Vegetation - Appendix H

Treatment Acres by Fire Severity by Vegetation on National Forest Lands for the Project Area and as Treated by Each Alternative

Table H.1 Vegetation Types by Fire Severity for National Forest System Lands in the Analysis Area

Vegetation Type	Basal Area Mortality (acres)				Grand Total
	0-25%	25-75%	75-90%	90%+	
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	18,069	3,380	982	17,295	**39,726**
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	624	289	93	1,073	**2,079**
Early-Seral Conifer and Conifer/Hardwood	2,360	650	212	3,036	**6,258**
Non-Forested Areas	1,115	530	189	2,183	**4,017**
Hardwood	3,889	1,491	425	5,774	**11,579**
Grand Total	**26,057**	**6,340**	**1,901**	**29,362**	**63,659**

Table H.2 Analyzed Area of Effects for Proposed Treatments by Basal Area Mortality for Alternative 2

Treatment Type and Vegetation Type	Basal Area Mortality				Grand Total
	0-25%	25-75%	75-90%	90%+	
Harvest (Salvage or Biomass)	**1,252**	**1,119**	**410**	**8,865**	**11,646**
Mid- to Late-Seral Closed Canopy Conifer and	803	694	249	6,217	7,963
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	206	182	60	800	1,248
Early-Seral Conifer and Conifer/Hardwood	153	149	61	915	1,279
Non-Forested Areas	47	53	26	539	665
Hardwood	43	41	13	394	490
Burn Only	**42**	**61**	**29**	**1,925**	**2,058**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	4	7	3	1,103	1,118
Early-Seral Conifer and Conifer/Hardwood	1	1	1	191	195
Non-Forested Areas	25	21	10	96	152
Hardwood	12	32	14	535	593
Hand Fall and Pile	**122**	**106**	**33**	**594**	**855**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	67	24	7	150	248

Treatment Type and Vegetation Type	Basal Area Mortality				Grand Total
	0-25%	25-75%	75-90%	90%+	
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	4	5	2	16	27
Early-Seral Conifer and Conifer/Hardwood	5	13	4	74	96
Non-Forested Areas	15	29	9	130	184
Hardwood	31	36	11	223	301
Hazard Tree Falling for Resource Protection	**81**	**38**	**16**	**215**	**351**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	58	20	7	128	213
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	2	4	2	11	19
Early-Seral Conifer and Conifer/Hardwood	14	7	2	33	56
Non-Forested Areas	3	5	2	16	27
Hardwood	3	3	2	27	35
Mastication and Hazard Tree Falling	**61**	**57**	**30**	**332**	**480**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	37	29	13	137	217
Early-Seral Conifer and Conifer/Hardwood	19	9	3	43	75
Non-Forested Areas	2	3	2	66	72
Hardwood	4	16	12	86	117
Mastication or Piling	**86**	**105**	**46**	**900**	**1,137**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	24	17	7	138	187
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	2	9	5	59	76
Early-Seral Conifer and Conifer/Hardwood	53	64	26	538	680
Non-Forested Areas	5	12	6	149	172
Hardwood	2	3	2	16	23
Plant and Release Only		**2**	**2**	**423**	**428**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood		-	-	37	37
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood		-	-	6	6
Early-Seral Conifer and Conifer/Hardwood	-	1	1	252	254
Non-Forested Areas		-	1	128	129

Treatment Type and Vegetation Type	Basal Area Mortality				Grand Total
	0-25%	25-75%	75-90%	90%+	
Hardwood				1	1
Watershed Improvement Treatment Only*	**2**	**6**	**4**	**275**	**287**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	2	5	3	203	213
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	-	-	-	20	20
Early-Seral Conifer and Conifer/Hardwood	-	-	-	16	16
Non-Forested Areas	-	-	-	31	31
Hardwood	-	-	-	5	5
Roadside Hazard Tree Removal Only*	**1,721**	**304**	**91**	**848**	**2,964**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	1,217	166	50	469	1,902
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	69	17	3	19	108
Early-Seral Conifer and Conifer/Hardwood	248	46	13	95	402
Non-Forested Areas	76	28	9	91	205
Hardwood	111	47	16	173	347

***** Areas of proposed Watershed Improvement Treatments and Roadside Hazard occur in additional areas proposed for other treatments with this Alternative.

Table H.3 Roadside Hazard Removal Proposed in Areas that Overlap with Non-Harvest Proposed Treatment in Alternative 2

Treatment Type and Vegetation Type	Basal Area Mortality				Grand Total
	0-25%	25-75%	75-90%	90%+	
Burn Only	**0**	**2**	**1**	**168**	**171**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood		0		99	99
Early-Seral Conifer and Conifer/Hardwood		0		29	29
Non-Forested Areas	0	1	1	19	22
Hardwood				21	21
Hand Fall and Pile	**16**	**14**	**6**	**86**	**122**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	9	3	1	20	33

Treatment Type and Vegetation Type	Basal Area Mortality				Grand Total
	0-25%	25-75%	75-90%	90%+	
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	2	2	1	3	7
Early-Seral Conifer and Conifer/Hardwood	0	1	0	8	10
Non-Forested Areas	2	3	2	18	25
Hardwood	3	4	2	36	46
Hazard Tree Falling for Resource Protection	**18**	**10**	**5**	**41**	**75**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	12	5	2	27	47
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	2	3	2	3	10
Early-Seral Conifer and Conifer/Hardwood	3	1	0	7	11
Non-Forested Areas	0	0	0	3	4
Hardwood	1	1	0	1	2
Mastication and Hazard Tree Falling	**1**	**6**	**3**	**19**	**30**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	0	4	2	2	8
Early-Seral Conifer and Conifer/Hardwood	1	2	1	10	14
Non-Forested Areas	0	1	1	6	8
Mastication or Piling	**40**	**44**	**16**	**212**	**312**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	15	9	3	32	59
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	1	5	2	10	19
Early-Seral Conifer and Conifer/Hardwood	21	26	8	131	186
Non-Forested Areas	2	4	2	36	44
Hardwood	0	0	0	3	4
Plant and Release Only		**1**	**1**	**116**	**118**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood		0		14	14

Treatment Type and Vegetation Type	Basal Area Mortality				Grand Total
	0-25%	25-75%	75-90%	90%+	
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood		0	0	3	4
Early-Seral Conifer and Conifer/Hardwood		0	0	67	68
Non-Forested Areas		0	1	32	33
Hardwood				0	0
Watershed Improvement Treatment Only	**0**	**2**	**2**	**28**	**32**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	0	2	1	25	29
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood			0	2	2

Table H.4 Analyzed Area of Effects for Proposed Treatments by Basal Area Mortality for Alternative 3

Treatment Type and Vegetation Type	Basal Area Mortality				Grand Total
	0-25%	25-75%	75-90%	90%+	
Harvest (Salvage or Biomass)	**795**	**712**	**258**	**7,013**	**8,778**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	500	452	163	5,055	6,169
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	154	126	41	602	923
Early-Seral Conifer and Conifer/Hardwood	91	82	31	627	831
Non-Forested Areas	34	34	17	437	521
Hardwood	17	20	6	292	335
Burn Only	**46**	**66**	**32**	**1,942**	**2,085**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	6	11	6	1,114	1,137
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood				0	0
Early-Seral Conifer and Conifer/Hardwood	1	1	1	191	195
Non-Forested Areas	26	21	10	96	153
Hardwood	13	33	14	540	599

Treatment Type and Vegetation Type	Basal Area Mortality				Grand Total
	0-25%	25-75%	75-90%	90%+	
Hand Fall and Pile	**74**	**49**	**14**	**355**	**492**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	57	14	4	122	198
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	2	3	1	15	21
Early-Seral Conifer and Conifer/Hardwood	3	7	2	58	70
Non-Forested Areas	9	18	4	68	100
Hardwood	3	7	3	92	104
Hazard Tree Falling for Resource Protection	**59**	**35**	**15**	**186**	**296**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	39	17	6	109	170
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	2	4	2	10	18
Early-Seral Conifer and Conifer/Hardwood	14	7	2	28	50
Non-Forested Areas	2	5	2	15	24
Hardwood	3	3	2	25	33
Mastication and Hazard Tree Falling	**46**	**56**	**30**	**332**	**464**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	26	29	13	137	205
Early-Seral Conifer and Conifer/Hardwood			0	0	0
Non-Forested Areas	15	9	3	43	69
Hardwood	2	3	2	66	72
Mastication or Piling	4	16	12	86	117
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	**58**	**66**	**28**	**561**	**713**
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	21	14	5	63	103
Early-Seral Conifer and Conifer/Hardwood	2	8	5	50	66
Non-Forested Areas	32	36	13	317	399
Hardwood	2	5	3	121	131
Plant and Release Only	1	2	1	11	15

Treatment Type and Vegetation Type	Basal Area Mortality				Grand Total
	0-25%	25-75%	75-90%	90%+	
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	**0**	**2**	**1**	**419**	**422**
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood		0		36	36
Early-Seral Conifer and Conifer/Hardwood		0	0	6	6
Non-Forested Areas	0	1	0	249	250
Hardwood	0	0	1	127	129
Watershed Improvement Treatment Only*				1	1
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	**2**	**6**	**4**	**282**	**294**
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	2	5	3	203	212
Early-Seral Conifer and Conifer/Hardwood		0	0	16	16
Non-Forested Areas	0	1	1	29	30
Hardwood	0	0	0	28	28
Roadside Hazard Tree Removal Only*	0	0	0	6	7
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	**1,741**	**326**	**101**	**1,044**	**3,211**
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	1,228	176	54	557	2,015
Early-Seral Conifer and Conifer/Hardwood	69	17	4	29	120
Non-Forested Areas	253	53	16	140	462
Hardwood	78	30	10	102	219

***** Areas of proposed Watershed Improvement Treatments and Roadside Hazard also occur in areas proposed for other treatments with this Alternative.

Table H.5 Roadside Hazard Removal Proposed in Areas that Overlap with Non-Harvest Proposed Treatment in Alternative 3

Treatment Type and Vegetation Type	Basal Area Mortality				Grand Total
	0-25%	25-75%	75-90%	90%+	
Burn Only		**2**	**1**	**168**	**171**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood		0		99	99
Early-Seral Conifer and Conifer/Hardwood				29	29
Non-Forested Areas		1	1	19	22
Hardwood				21	21
Hand Fall and Pile	**12**	**10**	**4**	**52**	**78**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	9	1	1	16	26
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	2	2	1	3	7
Early-Seral Conifer and Conifer/Hardwood	0	1	0	6	8
Non-Forested Areas	1	3	1	17	22
Hardwood	1	2	1	10	14
Hazard Tree Falling for Resource Protection	**13**	**10**	**5**	**41**	**68**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	8	4	2	27	41
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	2	3	2	3	10
Early-Seral Conifer and Conifer/Hardwood	3	1	0	7	11
Non-Forested Areas		0	0	3	4
Hardwood	1	1	0	1	2
Mastication and Hazard Tree Falling	**1**	**6**	**3**	**19**	**30**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	0	4	2	2	8
Early-Seral Conifer and Conifer/Hardwood	1	2	1	10	14
Non-Forested Areas	0	1	1	6	8
Mastication or Piling	**36**	**39**	**13**	**181**	**268**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	14	8	3	25	51

Treatment Type and Vegetation Type	Basal Area Mortality				Grand Total
	0-25%	25-75%	75-90%	90%+	
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	1	5	2	9	18
Early-Seral Conifer and Conifer/Hardwood	19	22	6	114	161
Non-Forested Areas	1	4	2	31	37
Hardwood	0	0	0	1	1
Plant and Release Only		**1**	**1**	**116**	**118**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood		0		14	14
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood		0	0	3	4
Early-Seral Conifer and Conifer/Hardwood		0	0	67	68
Non-Forested Areas		0	1	32	33
Watershed Improvement Treatment Only	**0**	**2**	**2**	**38**	**42**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	0	2	1	34	37
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood			0	2	2
Early-Seral Conifer and Conifer/Hardwood		0	0	1	1

Table H.6 Analyzed Area of Effects for Proposed Treatments by Basal Area Mortality for Alternative 4

Treatment Type and Vegetation Type	Basal Area Mortality				Grand Total
	0-25%	25-75%	75-90%	90%+	
Harvest (Salvage, Roadside Salvage or Biomass)	**3,984**	**1,618**	**565**	**10,619**	**16,786**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	2,675	965	331	7,174	11,145
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	320	206	70	837	1,433
Early-Seral Conifer and Conifer/Hardwood	536	214	76	1,102	1,927
Non-Forested Areas	234	112	44	690	1,080
Hardwood	218	122	44	817	1,201
Burn Only	**42**	**61**	**29**	**1,865**	**1,997**

Treatment Type and Vegetation Type	Basal Area Mortality				Grand Total
	0-25%	25-75%	75-90%	90%+	
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	4	7	3	1,075	1,089
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood				0	0
Early-Seral Conifer and Conifer/Hardwood	1	1	1	174	178
Non-Forested Areas	25	21	10	90	146
Hardwood	12	32	14	525	583
Hand Fall and Pile	**229**	**100**	**28**	**484**	**840**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	155	27	7	131	320
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	2	3	1	11	16
Early-Seral Conifer and Conifer/Hardwood	16	12	4	63	95
Non-Forested Areas	18	26	8	107	159
Hardwood	38	32	8	172	250
Hazard Tree Falling for Resource Protection	**55**	**25**	**9**	**160**	**249**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	39	13	4	90	146
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	0	0	0	8	8
Early-Seral Conifer and Conifer/Hardwood	10	6	2	24	41
Non-Forested Areas	3	4	2	13	22
Hardwood	2	2	2	25	31
Mastication and Hazard Tree Falling	**61**	**57**	**30**	**332**	**480**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	37	29	13	137	216
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood			0	0	0
Early-Seral Conifer and Conifer/Hardwood	19	9	3	43	75
Non-Forested Areas	2	3	2	66	72
Hardwood	4	16	12	86	117
Mastication or Piling	**87**	**108**	**47**	**921**	**1,162**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	26	20	8	155	208

Treatment Type and Vegetation Type	Basal Area Mortality				Grand Total
	0-25%	25-75%	75-90%	90%+	
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	2	9	5	59	76
Early-Seral Conifer and Conifer/Hardwood	53	65	26	542	686
Non-Forested Areas	5	12	6	149	172
Hardwood	1	2	1	15	20
Plant and Release Only	**0**	**2**	**2**	**405**	
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood		0	0	37	37
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood		0	0	6	6
Early-Seral Conifer and Conifer/Hardwood	0	1	1	237	239
Non-Forested Areas	0	0	1	125	127
Watershed Improvement Treatment Only*	**66**	**69**	**36**	**481**	**652**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	38	32	15	152	237
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	0	2	2	405	410
Early-Seral Conifer and Conifer/Hardwood	19	9	4	80	112
Non-Forested Areas	2	3	2	72	78
Hardwood	4	17	12	323	356
Roadside Hazard Tree Removal Only*	**71**	**27**	**8**	**180**	**287**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	35	11	4	111	160
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	11	2	0	8	21
Early-Seral Conifer and Conifer/Hardwood	16	7	3	19	46
Non-Forested Areas	9	7	2	16	33
Hardwood	1	0	0	26	27

***** Areas of proposed Watershed Improvement Treatments and Roadside Hazard also occur in areas proposed for other treatments with this Alternative.

Table H.7 Roadside Hazard Removal Proposed in Areas that Overlap with Non-Harvest Proposed Treatment in Alternative 4

Treatment Type and Vegetation Type	Basal Area Mortality				Grand Total
	0-25%	25-75%	75-90%	90%+	
Burn Only				**31**	**31**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood				17	17
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood				0	0
Early-Seral Conifer and Conifer/Hardwood				5	5
Non-Forested Areas				2	2
Hardwood				7	7
Hand Fall and Pile				**6**	**6**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood				4	4
Non-Forested Areas				1	1
Hardwood				2	2
Hazard Tree Falling for Resource Protection				**1**	**1**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood				1	1
Mastication or Piling	**2**	**6**	**2**	**56**	**67**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood	0	1	1	9	10
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood	0	0	0	1	1
Early-Seral Conifer and Conifer/Hardwood	2	5	2	38	48
Non-Forested Areas		0	0	8	8
Plant and Release Only		**0**	**0**	**35**	**35**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood				6	6
Mid- to Late-Seral Open Canopy Conifer and Conifer/Hardwood				1	1

Treatment Type and Vegetation Type	Basal Area Mortality				Grand Total
	0-25%	25-75%	75-90%	90%+	
Early-Seral Conifer and Conifer/Hardwood			0	20	20
Non-Forested Areas		0	0	8	8
Watershed Improvement Treatment Only				**1**	**1**
Mid- to Late-Seral Closed Canopy Conifer and Conifer/Hardwood				1	1

Treatment by Fire Severity and Vegetation Type for Each Alternative

Table H.8 Probable Changes in CWHR Resulting from the King Fire

CWHR Vegetation Type	Percent Basal Area Mortality	Post-Fire Typing Convention
MHC, JPN, PPN, RFR, SMC, WFR,	0	No change in CWHR Veg Type, Size, or Density Classes
	0-10	No change in CWHR Veg Type, Size, or Density Classes
	10-25	No change in CWHR Veg Type, Size, or Density Classes in most cases
	25-50	No change in CWHR Veg Type or Size, but CWHR Density D/M →P, P→S
	50-75	No change in CWHR Veg Type or Size Class, but CWHR Density D/M/P →S
	75-90	Change Veg Type to MCP or, in the case of MCH, potentially to MHW, CWHR Size → 1 and Density to "null"
	90-100	Change Veg Type to MCP or, in the case of MCH, potentially to MHW, CWHR Size → 1 and Density to "null"
AGS, BAR, CRC, LAC, MCP, PGS, RIV, URB, WTM	0-100	No Change in Veg Type or Size Class density (because these types often don't have size class or density associated with them)
BOP, BOW, CPC, MHW, MRI	0-25	No Change in CWHR Veg Type, Size, or Density Classes
	25-50	No change in Veg Type or Size, but CWHR Density D/M →P, P stays P and S stays S
	50-75	No change in CWHR Veg Type or Size Class, but CWHR Density D →P and M/P→S
	75-100	No change in CWHR Veg Type, but change Size and Density Classes to 1 and "null" respectively

AGS = Annual Grass
BAR = Barren
BOP = Blue Oak-Foothill Pine
BOW = Blue Oak Woodland
CPC = Closed Cone Pine
CRC = Chamise-Redshank Chaparral
JPN = Jeffrey Pine
LAC = Lacustrine
MHC = Montane Hardwood-Conifer
MCP = Montane Chaparral
MHW = Montane Hardwood
MRI = Montane Riparian
PGS = Perennial Grassland
PPN = Ponderosa Pine
RIV = Riverine
SMC = Sierran Mixed Conifer
RFR = Red Fir
URB = Urban
WFR = White Fir
WTM = Wet Meadow

Watersheds – Appendix I

King Fire Restoration Project
Eldorado National Forest – Georgetown and Pacific Ranger Districts
Riparian Conservation Objectives Consistency Report
April 8, 2015

This report evaluates the King Fire Restoration Project with respect to the Riparian Conservation Objectives (RCOs) and associated Standards and Guidelines (S&Gs) of the Sierra Nevada Forest Plan Amendment (SNFPA) of 2004, which amends the Eldorado National Forest Plan of 1988.

Implementation of this project is expected to meet all of the RCOs and associated S&Gs.

/s/
Vince Pacific, Hydrologist

/s/
Maura Santora, Aquatic Biologist

/s/
Blake Engelhardt, Botanist

/s/
Eric Nicita, Soil Scientist

The Sierra Nevada Forest Plan Amendment Record of Decision (SNFPAROD) of 2004 requires that a site-specific analysis be conducted in order to determine the type and extent of activities that can occur within Riparian Conservation Areas (RCAs) adjacent to aquatic features. Descriptions of RCAs as designated by SNFPROD (2004) are presented in Table 1.

Table 1. Riparian Conservation Areas (RCAs) Adjacent to Aquatic Features as Designated by the Sierra Nevada Forest Plan Amendment Record of Decision (SNFPROD) of 2004.[1]

Aquatic feature	Riparian Conservation Area
Perennial stream	300 feet on each side of the stream, measured from the bank full edge of the stream
Seasonally flowing streams (includes intermittent and ephemeral streams)	150 feet on each side of the stream, measured from the bank full edge of the stream
Special aquatic features (includes lakes, wet meadows, bogs, fens, wetlands, vernal pools, and springs)	300 feet from the edge of the features or riparian vegetation, whichever width is greater
Perennial streams with riparian conditions extending more than 150 feet from the edge of the streambank or seasonally flow streams extending more than 50 feet from the edge of the streambank	300 feet from the edge of the features or riparian vegetation, whichever width is greater
Streams in inner gorge	Top of inner gorge. (The inner gorge is defined by stream adjacent slopes greater than 70% gradient.)
Other hydrological or topographic depressions without a defined channel	RCA width and protection measures determined through project level analysis

[1] Riparian Conservation Areas (RCAs) are designated on page 42 of the SNFPAROD (2004); RCOs are described on pages 33 and 34.

Many RCAs burned at high intensity during the King Fire, which resulted in removal of groundcover and riparian vegetation, and increased erosion and sediment transport to streams. Treatment activities are proposed within RCAs that burned at moderate and high intensity to reduce future fuel loading and promote improvements to habitat and water quality. “Treatment zones” have been designated within RCAs, which have specific operating guidelines (Table 2.13 of the EIS). These include mechanical exclusion zones that generally range from 50-100 feet or greater on perennial and intermittent streams (or 25 feet beyond the edge of riparian vegetation, whichever is greater), and 10-25 feet or greater on ephemeral streams. At a limited number of locations (referred to as Watershed Sensitive Areas in the EIS), some ground disturbance is proposed within mechanical exclusion zones where additional work is necessary to promote recovery or fall hazard trees within these areas. Varied levels of ground disturbance would be permitted in middle and outer treatment zones. BMPs, mitigation measures, and project design criteria would minimize potential for impacts. Implementation of the proposed action would likely result in short-term impacts to riparian and aquatic habitat from logging-related compaction and erosion, but long-term improvements to RCAs and associated aquatic features and habitat by increasing groundcover and reducing erosion and sediment transport to streams and other aquatic features. Treatment activities would also reduce or eliminate erosion from past ground disturbances within and adjacent to RCAs, the severity of which has increased as a result of the fire.

The SNFPROD (2004) contains six RCOs that apply to activities within RCAs.

Riparian Conservation Objective #1: *Ensure that identified beneficial uses for the water body are adequately protected. Identify the specific beneficial uses for the project area, water quality goals from the Regional Basin Plan, and the manner in which the standards and guidelines will protect the beneficial uses.*

The California Regional Water Quality Control Board, Central Valley Region, has established beneficial uses for surface water bodies in the *Fourth Edition of the Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River Basins* (2007). The project area is within both the Middle Fork of the American River Watershed and the South Fork of the American River Watershed. Currently, the Middle Fork American River from its source to Folsom Lake, California, has been designated by the State for: municipal and domestic supply, irrigation, stock watering, power, contact and other non-contact recreation, canoeing and rafting, warm and cold freshwater fisheries habitat migration and spawning, and wildlife habitat. The South Fork American River, from its source to Placerville, has been designated by the State for: municipal and domestic water supply, power, contact and other non-contact recreation, canoeing and rafting, warm and cold freshwater fisheries habitat migration and spawning, and wildlife habitat. The Stumpy Meadows Reservoir, which is adjacent to the project site, is the sole drinking water supply for the town of Georgetown and surrounding areas.

The California Regional Water Quality Control Board, Central Valley Region, has established water quality objectives for inland surface waters in the Sacramento and San Joaquin River Basins (Appendix A). Parameters of particular concern with respect to the proposed action would be sediment, settleable materials, suspended materials, and turbidity. These parameters have the potential to adversely impact water quality and aquatic habitat which could in turn affect beneficial uses of water. BMPs and project design criteria would be applied to ensure adequate protection of the beneficial uses of water within the project area. These would include near-stream riparian mechanical exclusion zones and post-implementation groundcover requirements.

The *Section 303(d) List of Water Quality Limited Segments* (2006) was created by the Central Valley Regional Board to comply with Section 303(d) of the Clean Water Act of 1972 which requires each state to identify water bodies that fail to meet applicable water quality standards established by the US EPA. The South Fork American River, from below Slab Creek Reservoir to Folsom Lake, is on the State 303(d) List with respect to elevated levels of mercury due to resource extraction (mining). This project would not impact mercury concentrations in the South Fork American River. No other 303(d) streams are located within or downstream of the project area.

Each RCO contains applicable standards and guidelines. See Appendix B for analysis of each standard and guideline with respect to the proposed actions. The implementation of these standards and guidelines, along with applicable BMPs, would protect the beneficial uses of water.

Riparian Conservation Objective #2: *Maintain or restore: 1) the geomorphic and biological characteristics of special aquatic features, including lakes, meadows, bogs, fens, wetlands, vernal pools, springs; 2) streams, including instream flows; and 3) hydrologic connectivity both within and between watersheds to provide for the habitat needs of aquatic-dependent species.*

The primary threat to these aquatic features is the increased watershed response in uplands burned by the fire. Post-fire BAER treatments included mulching to reduce soil erosion and maintenance and improvements to road drainage structures to reduce the potential for road washouts. Project activities may have some short-term impacts to the geomorphic and biological characteristics of streams and other aquatic features within the project area. For example, there is potential for compaction, erosion, and sediment delivery to aquatic features with use of heavy machinery in RCAs which could decrease the quality of cold water fish habitat by infilling pools and embedding spawning gravels. Alternatively, land disturbance could cause concentration of surface runoff, which could result in detrimental changes to stream channel condition that could subsequently have effects on downstream water quality and beneficial uses. However, BMPs, project design criteria, and applicable standards and guidelines would minimize impacts. Further, the areas where work is proposed within RCAs burned at high intensity, and all groundcover and riparian vegetation was

fully consumed at most locations. Salvage logging would result in increased groundcover that would reduce sediment transport to streams and aid in riparian zone recovery following the fire.

The project also proposes small-scale stream and RCA restoration, such as treating gullies and stabilizing streambanks at a limited number of locations. Larger-scale restoration of impaired aquatic features is outside the scope of this project; however, identified restoration needs may be addressed in future projects.

Riparian Conservation Objective #3: *Ensure a renewable supply of large down logs that: 1) can reach the stream channel, and 2) provide suitable habitat within and adjacent to the RCA.*

Mechanical exclusion zones within RCAs (Table 2.13 of the EIS) would ensure a renewable supply of large down logs within and adjacent to stream channels due to the large number of snags within these areas. In the areas outside of mechanical exclusion zones, but still within RCAs, requirements for standing snags and large down logs would ensure a long-term supply of large wood to provide suitable habitat. Reforestation, following requirements set forth in project design criteria, in areas that are salvage logged would also contribute to long-term large wood recruitment.

Riparian Conservation Objective #4: *Ensure that management activities, including fuels reduction actions, within RCAs and CARs enhance or maintain physical and biological characteristics associated with aquatic- and riparian-dependent species.*

No CARs are present within the project area. The Proposed Action would result in short-term impacts but long-term improvements to RCAs. Use of heavy machinery in and adjacent to RCAs may lead to ground disturbance and increased potential for sediment transport to streams. However, BMPs and project design criteria would limit the potential for these short-term impacts. While short-term impacts may occur, the project would lead to long-term improvements and enhance both the physical and biological characteristics associated with aquatic- and riparian-dependent species. For example, groundcover was fully consumed in many of the logging units, and implementation of this project would increase groundcover which would reduce future erosion.

Riparian Conservation Objective #5: *Preserve, restore, or enhance special aquatic features, such as meadows, lakes, ponds, bogs, fens, and wetlands to provide the ecological conditions and processes needed to recover or enhance the viability of species that rely on these areas.*

In general, mechanical exclusion would prevent disturbance to aquatic features. Treatments in middle and outer RCA zones may result in short-term impacts such as soil compaction and erosion. However, BMPs and project design criteria would minimize potential for these short-term impacts. The areas in which treatments are proposed burned at high intensity and little to no groundcover or riparian vegetation is present. Implementation of project design criteria would result in increased groundcover, and planting trees and native riparian vegetation in areas that are logged is proposed would enhance habitat over the long-term in areas of moderate and high burn severity.

Riparian Conservation Objective #6: *Identify and implement restoration actions to maintain, restore, or enhance water quality and maintain, restore, or enhance habitat for riparian and aquatic species.*

Project activities would increase groundcover and provide habitat within RCAs due to snag and large down wood design criteria. Treatments would also include obliteration of existing disturbances such as old skid trails and landings that are current sources of erosion. The project also proposes small-scale stream and RCA restoration projects, such as stabilizing streambanks and gullies at a limited number of locations. Implementation of these projects would restore or enhance water quality and habitat for riparian and aquatic species. Larger-scale restoration of impaired

aquatic features is outside the scope of this project; however, identified restoration needs may be addressed in future projects.

References Cited

Central Valley Regional Water Quality Control Board. 2008. Internet Site containing the proposed 303(d) list for the central valley region of California http://www.waterboards.ca.gov/tmdl/docs/303dlists2006/final/r5_final303dlist.pdf

Central Valley Regional Water Quality Control Board. 2009. Internet containing Basin Plan for the Central Valley Region. http:/www.swrcb.ca.gov/centralvalley/water_issues/basin_plans

USDA Forest Service. January 2004. Sierra Nevada Forest Plan Amendment, Final Environmental Impact Statement, Record of Decision.

WATER QUALITY OBJECTIVES FOR INLAND SURFACE WATERS

Category	Standard
Bacteria	In waters designated for contact recreation, the fecal coliform concentration based on a minimum of not less than five samples for any 30-day period shall not exceed a geometric mean of 200/100 ml, nor shall more than ten percent of the total number of samples taken during any 30-day period exceed 400/100 ml.
Chemical Constituents	Waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses.
Color	Water shall be free of discoloration that causes nuisance or adversely affects beneficial uses.
Dissolved Oxygen	Dissolved oxygen concentrations shall not be reduced below the following minimum levels at any time: ▪ Waters designated WARM 5.0 mg/l ▪ Waters designated COLD 7.0 mg/l ▪ Waters designated SPWN 7.0 mg/l
Floating Material	Water shall not contain floating material in amounts that cause nuisance or adversely affect beneficial uses.
Oil and Grease	Waters shall not contain oils, greases, waxes, or other material in concentrations that cause nuisance, result in visible film or coating on the surface of the water or on objects in the water, or otherwise adversely affect beneficial uses.
pH	The pH shall not be depressed below 6.5 nor raised above 8.5.
Pesticides	▪ No individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses. ▪ Discharges shall not result in pesticide concentrations in bottom sediments or aquatic life that adversely affect beneficial uses. ▪ Total identifiable persistent chlorinated hydrocarbon pesticides shall not be present in the water column at concentrations detectable within the accuracy of analytical methods approved by the EPA or the Executive Officer. ▪ Pesticide concentrations shall not exceed those allowable by applicable antidegradation policies (see State Water Resources Control Board Resolution No. 68-16 and 40 C.F.R. Section 131.12.). ▪ Pesticide concentrations shall not exceed the lowest levels technically and economically achievable. ▪ Waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of pesticides in excess of the Maximum Contaminant Levels set forth in California Code of Regulations, Title 22, Division 4, Chapter 15. ▪ Waters designated for use as domestic or municipal supply shall not contain concentrations of thiobencarb in excess of 1.0 µg/l.
Total Dissolved Solids	Shall not exceed 100 mg/l (90 percentile)
Sediment	The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.

Category	Standard
Suspended Material	Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.
Tastes and Odors	Water shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to domestic or municipal water supplies or to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses.
Temperature	At no time or place shall the temperature of COLD or WARM interstate waters be increased more than 5˚F above natural receiving water temperature.
Toxicity	All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life.
Turbidity	Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. Increases in turbidity attributable to controllable water quality factors shall not exceed the following limits: ▪ Where natural turbidity is less than 1 Nephelometric Turbidity Unit (NTU), controllable factors shall not cause downstream turbidity to exceed 2. ▪ Where natural turbidity is between 1 and 5 NTUs, increases shall not exceed 1 NTU. ▪ Where natural turbidity is between 5 and 50 NTUs, increases shall not exceed 20 percent. ▪ Where natural turbidity is between 50 and 100 NTUs, increases shall not exceed 10 NTUs. ▪ Where natural turbidity is greater than 100 NTUs, increases shall not exceed 10 percent.

California Regional Water Quality Control Board, Central Valley Region, Basin Plan (2007).

APPENDIX B. RIPARIAN CONSERVATION (RCAs & RCOs) STANDARDS and GUIDELINES

Riparian Conservation Areas and Critical Aquatic Refuges	
Standard and Guideline	**Analysis with respect to Proposed Action**
91. Designate riparian conservation area (RCA) widths as described in Table 6 above. The RCA widths displayed in Table 2 may be adjusted at the project level if a landscape analysis has been completed and a site-specific RCO analysis demonstrates a need for different widths.	RCA widths are shown in Table 2.13 of the EIS, which includes mechanical exclusion zones and middle and outer zones with specific operating requirements and restrictions. The widths were chosen as they would provide for improvement to riparian zone conditions while at the same time providing adequate protection for RCAs and dependent species.
92. Evaluate new proposed management activities within CARs and RCAs during environmental analysis to determine consistency with the riparian conservation objectives at the project level and the AMS goals for the landscape. Ensure that appropriate mitigation measures are enacted to (1) minimize the risk of activity-related sediment entering aquatic systems and (2) minimize impacts to habitat for aquatic- or riparian-dependent plant and animal species.	There are no CARs within the project area. The proposed activities within RCAs would be consistent with RCOs, and implementation of this project would maintain or improve aquatic habitat and channel complexity from its current post-fire condition. The proposed activities would be implemented with applicable BMPs and project design criteria, and by following RCA and RCO standards and guidelines to minimize potential for activity-related sediment from entering streams and negatively impacting aquatic and riparian-dependent plant and animal species.
93. Identify existing uses and activities in CARs and RCAs during landscape analysis. At the time of permit reissuance, evaluate and consider actions needed for consistency with RCOs.	Existing uses and activities were identified as part of project analysis. Implementation of BMPs and project design criteria would ensure consistency with RCOs.
94. As part of project-level analysis, conduct peer reviews for projects that propose ground-disturbing activities in more than 25 percent of the RCA or more than 15 percent of a CAR.	There are no CARs within the project area, and the footprint of ground disturbing activities in RCAs would not exceed the 25% threshold. Therefore, peer reviews are not necessary.
Riparian Conservation Objective #1: Ensure that identified beneficial uses for the water body are adequately protected. Identify the specific beneficial uses for the project area, water quality goals from the Regional Basin Plan, and the manner in which the standards and guidelines will protect the beneficial uses. (AMS goals: 1, 2, 7)	
95. For waters designated as “Water Quality Limited” (Clean Water Act Section 303(d)), participate in the development of Total Maximum Daily Loads (TMDLs) and TMDL Implementation Plans. Execute applicable elements of completed TMDL Implementation Plans.	The South Fork American River, from below Slab Creek Reservoir to Folsom Lake, is on the 303(d) list of impaired waters with respect to elevated levels of mercury due to resource extraction (mining). This project would not impact mercury levels in the South Fork American River and the TMDL monitoring plan would not be applicable to this project.

Standard and Guideline	Analysis with respect to Proposed Action
96. Ensure that management activities do not adversely affect water temperatures necessary for local aquatic- and riparian-dependent species assemblages.	The proposed activities would have negligible short term effects on water temperature. With the exception of hazard trees, no trees would be felled within streamside mechanical exclusion zones. Salvage logging within RCAs outside of the mechanical exclusion zone would only occur in areas of moderate to high burn intensity where the majority of trees had all needles consumed and thus provide little to no shade. Natural regeneration of riparian vegetation is already occurring and will provide stream shade as it becomes reestablished.
97. Limit pesticide applications to cases where project level analysis indicates that pesticide applications are consistent with riparian conservation objectives.	No new pesticide use within RCAs is proposed for this project. Limited pesticide use for targeted invasive species treatment would continue under the previous project decision Forestwide Treatment of Invasive Species Project (ENF 2013), which includes project design criteria to protect RCAs and associated plant and animal species.
98. Within 500 feet of known occupied sites for the California red-legged frog, Cascades frog, Yosemite toad, foothill yellow-legged frog, mountain yellow-legged frog, and northern leopard frog, design pesticide applications to avoid adverse effects to individuals and their habitats.	Pesticides would not be used within 500 feet of known occupied sites for California red-legged frog or within 300 feet of suitable habitat for mountain yellow-legged frog. Herbicide application for targeted invasive plant treatment within 500 feet will be reviewed and approved annually by the FS aquatic biologist, and design criteria will be implemented to ensure there is no adverse effect to individuals or their habitats.
99. Prohibit storage of fuels and other toxic materials within RCAs and CARs except at designated administrative sites and sites covered by a Special Use Authorization. Prohibit refueling within RCAs and CARs unless there are no other alternatives. Ensure that spill plans are reviewed and up-to-date.	Following BMPs and project design criteria, the storage of fuels and other toxic materials, servicing, and refueling would not occur within RCAs. BMPs and spill prevention measures to avoid adverse impacts to nearby water bodies would be implemented. Up-to-date spill plans would be required and reviewed prior to project implementation.
Riparian Conservation Objective #2: Maintain or restore: (1) the geomorphic and biological characteristics of special aquatic features, including lakes, meadows, bogs, fens, wetlands, vernal pools, springs; (2) streams, including in stream flows; and (3) hydrologic connectivity both within and between watersheds to provide for the habitat needs of aquatic-dependent species. (AMS goals: 2, 3, 4, 5, 6, 8, 9)	
100. Maintain and restore the hydrologic connectivity of streams, meadows, wetlands, and other special aquatic features by identifying roads and trails that intercept, divert, or disrupt natural surface and subsurface water flow paths. Implement corrective actions where necessary to restore connectivity.	Roads and trails that are disrupting natural surface and subsurface pathways and transporting sediment towards stream channels have been identified during field reconnaissance and through examination of LiDAR data. Treatment of these disturbances would enhance watershed hydrologic function and connectivity. Treatments may include subsoiling, waterbarring, removal of inslope berms, outsloping, backblading, and/or slash placement.

Standard and Guideline	Analysis with respect to Proposed Action
102. Prior to activities that could adversely affect streams, determine if relevant stream characteristics are within the range of natural variability. If characteristics are outside the range of natural variability, implement mitigation measures and short-term restoration actions needed to prevent further declines or cause an upward trend in conditions. Evaluate required long-term restoration actions and implement them according to their status among other restoration needs.	As a result of the fire, some sections of streams have characteristics that are not within the natural range of variability. For example, in areas where the riparian zone burned at high intensity, large wood within and adjacent to the stream channel was often consumed, and these sections of the streams are now deficient in large wood concentrations. Due to the large concentration of snags within RCAs that burned at high intensity, large wood concentrations within streams and throughout the RCA are expected to recover to within the natural range of variability. Further, in the areas of the RCAs outside of the mechanical exclusion zones where salvage logging is permitted, project design criteria require that minimum numbers of both standing and down large wood is retained to provide for long term recruitment.
103. Prevent disturbance to streambanks and natural lake and pond shorelines caused by resource activities (for example, livestock, off-highway vehicles, and dispersed recreation) from exceeding 20 percent of stream reach or 20 percent of natural lake and pond shorelines. Disturbance includes bank sloughing, chiseling, trampling, and other means of exposing bare soil or cutting plant roots. This standard does not apply to developed recreation sites, sites authorized under Special Use Permits and designated off-highway vehicle routes.	Mechanical exclusion zones in RCAs (Table 2.13 of the EIS) would prevent disturbance to streambanks as a result of project activities. Project design criteria limit the number of stream crossings and include specific measures to reduce potential impacts to streambanks. Disturbance to streambanks would not exceed 20 percent of a stream reach. Natural lake and pond shorelines would not be impacted by this project.
104. In stream reaches occupied by, or identified as “essential habitat” in the conservation assessment for, the Lahontan and Paiute cutthroat trout and the Little Kern golden trout, limit streambank disturbance from livestock to 10 percent of the occupied or “essential habitat” stream reach. (Conservation assessments are described in the record of decision.) Cooperate with State and Federal agencies to develop streambank disturbance standards for threatened, endangered, and sensitive species. Use the regional streambank assessment protocol. Implement corrective action where disturbance limits have been exceeded.	Not applicable to this project.

Standard and Guideline	Analysis with respect to Proposed Action
105. At either the landscape or project-scale, determine if the age class, structural diversity, composition, and cover of riparian vegetation are within the range of natural variability for the vegetative community. If conditions are outside the range of natural variability, consider implementing mitigation and/or restoration actions that will result in an upward trend. Actions could include restoration of aspen or other riparian vegetation where conifer encroachment is identified as a problem.	Riparian vegetation cover is currently outside of the natural range of variability in RCAs that burned at high intensity as most if not all vegetation was consumed by fire in these areas. Project design criteria and BMPs, in particular near-stream and riparian vegetation exclusion zones, are designed to reduce impacts to recovering riparian vegetation. Riparian vegetation is expected to recover quickly, and resprouting willows, maples, and sedges have already been observed in many areas.
106. Cooperate with Federal, Tribal, State and local governments to secure in stream flows needed to maintain, recover, and restore riparian resources, channel conditions, and aquatic habitat. Maintain in stream flows to protect aquatic systems to which species are uniquely adapted. Minimize the effects of stream diversions or other flow modifications from hydroelectric projects on threatened, endangered, and sensitive species.	Water rights are held by the Forest Service and water use would adhere to those limits specified in the water rights. Project design criteria and BMPs require that water drafting sites be approved by a hydrologist and aquatic biologist prior to use and specify flow thresholds in which water drafting must cease. With implementation of design criteria, water drafting would not adversely impact stream flows or lead to pool depletion. The project does not propose flow modifications from hydroelectric projects.
107. For exempt hydroelectric facilities on national forest lands, ensure that special use permit language provides adequate in stream flow requirements to maintain, restore, or recover favorable ecological conditions for local riparian- and aquatic-dependent species.	Not applicable to this project.
Riparian Conservation Objective #3: Ensure a renewable supply of large down logs that: (1) can reach the stream channel and (2) provide suitable habitat within and adjacent to the RCA. (AMS goals: 2, 3)	
108. Determine if the level of coarse large woody debris (CWD) is within the range of natural variability in terms of frequency and distribution and is sufficient to sustain stream channel physical complexity and stability. Ensure proposed management activities move conditions toward the range of natural variability.	In RCAs that burned at high intensity, CWD within and adjacent to some sections of stream channels was fully consumed, and therefore these areas are deficient in CWD. This project is designed to retain an adequate recruitment source for CWD due to near-stream mechanical exclusion zones and snag and CWD requirements. CWD within stream channels would also remain in place. At those channels in which visual reconnaissance occurred, CWD levels were found to be within the range of natural variability both upstream and downstream of sections that burned at high intensity.
Riparian Conservation Objective #4: Ensure that management activities, including fuels reduction actions, within RCAs and CARs enhance or maintain physical and biological characteristics associated with aquatic- and riparian-dependent species. (AMS goals: 2, 7)	

Standard and Guideline	Analysis with respect to Proposed Action
109. Within CARs, in occupied habitat or "essential habitat" as identified in conservation assessments for threatened, endangered, or sensitive species, evaluate the appropriate role, timing, and extent of prescribed fire. Avoid direct lighting within riparian vegetation; prescribed fires may back into riparian vegetation areas. Develop mitigation measures to avoid impacts to these species whenever ground-disturbing equipment is used.	Pile burning would be permitted in treatment units when necessary to reduce ground fuel accumulation. Project design criteria stipulate that burn piles would not be located within 100' of suitable CRLF or SNYLF habitat. Design criteria also require that piles would only be ignited on the side furthest from the nearest aquatic feature when within 1 mile of suitable CRLF or SNYLF habitat, or within 100 feet of streams and waterbodies. These requirements would also protect riparian vegetation.
110. Use screening devices for water drafting pumps. (Fire suppression activities are exempt during initial attack.) Use pumps with low entry velocity to minimize removal of aquatic species, including juvenile fish, amphibian egg masses and tadpoles, from aquatic habitats.	Specifications for pump intake screens and minimum flow requirements for drafting would minimize impacts to, and removal of, aquatic species. Low velocity pumps would also be required.
111. Design prescribed fire treatments to minimize disturbance of groundcover and riparian vegetation in RCAs. In burn plans for project areas that include, or are adjacent to RCAs, identify mitigation measures to minimize the spread of fire into riparian vegetation. In determining which mitigation measures to adopt, weigh the potential harm of mitigation measures, for example fire lines, against the risks and benefits of prescribed fire entering riparian vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuel management actions could be damaging to habitat or long-term function of the riparian community.	Project design criteria stipulate that burn piles would not be located within 100' of suitable CRLF or SNYLF habitat. Design criteria also require that piles would only be ignited on the side furthest from the nearest aquatic feature when within 1 mile of suitable CRLF or SNYLF habitat, or within 100 feet of streams and waterbodies. Project design criteria also stipulate that direct lighting of prescribed fires would not occur in riparian areas and would identify mitigation measures to minimize spread of fire into riparian vegetation. Due to project design criteria impacts to riparian vegetation and riparian- and aquatic-dependent species are not anticipated.
112. Post-wildfire management activities in RCAs and CARs should emphasize enhancing native vegetation cover, stabilizing channels by non-structural means, minimizing adverse effects from the existing road network, and carrying out activities identified in landscape analyses. Post-wildfire operations shall minimize the exposure of bare soil.	This project is designed to promote an upward trend in RCA conditions. Tree removal is proposed within RCAs (but outside of mechanical exclusion zones) where fire burned at moderate to high intensities. In these areas, most, if not all, groundcover and CWD was consumed, and barren ground, erosion, and sediment transport to streams has occurred at many locations. Project design criteria require 70% groundcover and various levels of CWD within RCAs, which would reduce erosion. This level of groundcover is not expected to negatively impact reestablishment of native vegetation, and planting of native riparian vegetation is proposed where recovery is limited. When sensitive plant species are present (see Botanical Resource Design Criteria), depth of slash material is limited to 2 inches so as not to impact reestablishment of these species.

Standard and Guideline	Analysis with respect to Proposed Action
113. Allow hazard tree removal within RCAs or CARs. Allow mechanical ground disturbing fuels treatments, salvage harvest, or commercial fuelwood cutting within RCAs or CARs when the activity is consistent with RCOs. Utilize low ground pressure equipment, helicopters, over the snow logging, or other non-ground disturbing actions to operate off of existing roads when needed to achieve RCOs. Ensure that existing roads, landings, and skid trails meet Best Management Practices. Minimize the construction of new skid trails or roads for access into RCAs for fuel treatments, salvage harvest, commercial fuelwood cutting, or hazard tree removal.	Hazard tree removal is proposed within RCAs, including within the mechanical exclusion zone when necessary. Operating requirements for ground based mechanical equipment generally prevent removal of hazard trees (but allow for felling) within near-stream exclusion zones to prevent ground disturbances, the exception being if logs can be removed with full suspension. Tree removal and other fuel treatments consistent with RCOs would be permitted in RCAs outside of the mechanical exclusion zone. Low ground pressure equipment would be required within RCAs to minimize negative impacts from logging operations, and groundcover and CWD requirement would improve RCA function and habitat that have been degraded as a result of the fire. Existing roads, landings, and skid trails would be required to meet BMPs, and all skid trails, temporary roads, and landings would be decommissioned after use. Construction of new skid trails in RCAs (outside of exclusion zones) would be limited to allow for achievement of RCOs.
114. As appropriate, assess and document aquatic conditions following the Regional Stream Condition Inventory protocol prior to implementing ground disturbing activities within suitable habitat for California red-legged frog, Cascades frog, Yosemite toad, foothill and mountain yellow-legged frogs, and northern leopard frog.	Project design criteria require that a qualified aquatic biologist would perform a survey 24 hours before project implementation to assess and document aquatic conditions. The survey would follow the methodology set forth by the USFWS.
15. During fire suppression activities, consider impacts to aquatic- and riparian-dependent resources. Where possible, locate incident bases, camps, helibases, staging areas, helispots, and other centers for incident activities outside of RCAs or CARs. During pre-suppression planning, determine guidelines for suppression activities, including avoidance of potential adverse effects to aquatic- and riparian-dependent species as a goal.	Fire suppression in response to prescribed burning is not anticipated due to requirements set forth in the burn plan. However, if suppression is necessary, or if a wildfire were to occur within the project area, incident activities would not be located within RCAs, and pre-suppression planning would occur to avoid potential adverse effects to aquatic- and riparian-dependent species.
116. Identify roads, trails, OHV trails and staging areas, developed recreation sites, dispersed campgrounds, special use permits, grazing permits, and day use sites during landscape analysis. Identify conditions that degrade water quality or habitat for aquatic and riparian-dependent species. At the project level, evaluate and consider actions to ensure consistency with standards and guidelines or desired conditions.	Roads, trails, etc. were identified during project analysis. Based upon field reconnaissance and analysis of LiDAR data, areas that have, or have potential to, degrade water quality and/or habitat were identified. These include previous logging disturbances such as roads, skid trails, and landings. Implementation of the proposed treatments in these areas would follow project design criteria and BMPs, and the treatments would reduce or eliminate negative impacts to water quality and/or habitat from these disturbances. The proposed actions would ensure consistency with applicable standards and guidelines and desired conditions.

Riparian Conservation Objective #5: Preserve, restore, or enhance special aquatic features, such as meadows, lakes, ponds, bogs, fens, and wetlands, to provide the ecological conditions and processes needed to recover or enhance the viability of species that rely on these areas. (AMS goals 1, 2, 3, 4, 7, 9)	
Standard and Guideline	**Analysis with respect to Proposed Action**
117. Assess the hydrologic function of meadow habitats and other special aquatic features during range management analysis. Ensure that characteristics of special features are, at a minimum, at Proper Functioning Condition, as defined in the appropriate Technical Reports (or their successor publications): (1) "Process for Assessing PFC" TR 1737-9 (1993), "PFC for Lotic Areas" USDI TR 1737-15 (1998) or (2) "PFC for Lentic Riparian-Wetland Areas" USDI TR 1737-11 (1994).	Range management analysis is not applicable to this project.
118. Prohibit or mitigate ground-disturbing activities that adversely affect hydrologic processes that maintain water flow, water quality, or water temperature critical to sustaining bog and fen ecosystems and plant species that depend on these ecosystems. During project analysis, survey, map, and develop measures to protect bogs and fens from such activities as trampling by livestock, pack stock, humans, and wheeled vehicles. Criteria for defining bogs and fens include, but are not limited to, presence of: (1) sphagnum moss (*Spagnum spp*.), (2) mosses belonging to the genus *Meessia*, and (3) sundew (*Drosera spp*.) Complete initial plant inventories of bogs and fens within active grazing allotments prior to re-issuing permits.	There are no bogs or fens known within the areas proposed for treatment. Botanical surveys will be conducted prior to project implementation and if any fens or bogs are detected within proposed treatment units they will be protected by design criteria and mechanical exclusion zones.
19. Locate new facilities for gathering livestock and pack stock outside of meadows and riparian conservation areas. During project-level planning, evaluate and consider relocating existing livestock facilities outside of meadows and riparian areas. Prior to re-issuing grazing permits, assess the compatibility of livestock management facilities located in riparian conservation areas with riparian conservation objectives.	Range management analysis is not applicable to this project.

Standard and Guideline	Analysis with respect to Proposed Action
120. Under season-long grazing: • For meadows in early-seral status: limit livestock utilization of grass and grass-like plants to 30 percent (or minimum 6-inch stubble height). • For meadows in late seral status: limit livestock utilization of grass and grass-like plants to a maximum of 40 percent (or minimum 4-inch stubble height). Determine ecological status on all key areas monitored for grazing utilization prior to establishing utilization levels. Use Regional ecological scorecards and range plant list in regional range handbooks to determine ecological status. Analyze meadow ecological status every 3 to 5 years. If meadow ecological status is determined to be moving in a downward trend, modify or suspend grazing. Include ecological status data in a spatially explicit Geographical Information System database. Under intensive grazing systems (such as rest-rotation and deferred rotation) where meadows are receiving a period of rest, utilization levels can be higher than the levels described above if the meadow is maintained in late seral status and meadow-associated species are not being impacted. Degraded meadows (such as those in early-seral status with greater than 10 percent of the meadow area in bare soil and active erosion) require total rest from grazing until they have recovered and have moved to mid- or late seral status.	Range management analysis is not applicable to this project.
121. Limit browsing to no more than 20 percent of the annual leader growth of mature riparian shrubs and no more than 20 percent of individual seedlings. Remove livestock from any area of an allotment when browsing indicates a change in livestock preference from grazing herbaceous vegetation to browsing woody riparian vegetation.	Range management analysis is not applicable to this project.
Riparian Conservation Objective #6: Identify and implement restoration actions to maintain, restore or enhance water quality and maintain, restore, or enhance habitat for riparian and aquatic species. (AMS goals: all)	

22. Recommend restoration practices in: (1) areas with compaction in excess of soil quality standards, (2) areas with lowered water tables, or (3) areas that are either actively down cutting or that have historic gullies. Identify other management practices, for example, road building, recreational use, grazing, and timber harvests, that may be contributing to the observed degradation.	Management practices and past disturbances that have caused degradation have been identified. These include old roads, skid trails, and landings. Restoration is proposed in areas with compaction in excess of soil quality standards, and at locations where disturbances are present and contributing to rill and gully erosion and sediment transport to streams and other aquatic features. Restoration activities include decommissioning of old roads, skid trails, and landings, increasing groundcover, and treating gullies and stabilizing streambanks. Long-term restoration activities are outside the scope of this project, but identified projects may be implemented under future projects.

Table developed from Standards and Guidelines on pages 62-66 of the 2004 SNFPA ROD.

Watersheds – Appendix J: Cumulative Watershed Effects Analysis

Cumulative Watershed Effects

Ground-disturbing activities have potential to cause impacts that persist through space and time. While one activity itself may not adversely impact the beneficial uses of water, the activity, when analyzed in connection with other past, present, and future activities across all ownerships within a watershed may lead to cumulative watershed effects (CWE).

With respect to the beneficial uses of water (described in the RCO analysis presented in Appendix A), the major concern of activities on forest land is sediment delivery to streams and associated degradation of aquatic habitat. The Pacific Southwest Region (Region 5) of the Forest Service has developed a standardized CWE analysis using the Equivalent Roaded Acres (ERA) method to assess the risk of increased sediment delivery to streams. This method was further refined and adapted for use on the Eldorado National Forest (ENF) (Carlson and Christiansen 1993).

ERA Methodology

In the ERA method, roads are considered to have the greatest potential to increase runoff and sediment delivery to streams. An index is calculated for each HUC7 watershed that depicts land use in terms of the percent of the watershed covered in roads. Roads are given a value of 1.0, and the acres of road surface in a watershed is multiplied by the index then divided by the size of the entire watershed to determine the percent of the watershed covered in roads.

Other land disturbing activities are given a number less than 1.0 depending on the expected impacts from each activity. The closer the number is to 1.0, the greater the likelihood that activity could contribute sediment to streams. The number of acres of each disturbance is multiplied by the index then divided by the size of the entire watershed. This gives the percent of the "equivalent roaded acres" in the watershed for each type of land disturbance. The values of equivalent roaded acres for all land disturbances within a watershed are added together, and the final number represents the percent of the watershed that is covered by the "equivalent" of roads.

In the ERA model, a Threshold of Concern (TOC) was developed for each watershed and is based upon watershed characteristics such as relief, geology, precipitation regime, and stream channel classification. The TOC is an estimate of the upper limit of watershed tolerance to disturbance, and generally ranges from 10-18 percent on the ENF. This means that when 10-18 percent of a watershed is covered in equivalent roaded acres, there is potential for measurable cumulative watershed effects. It is important to note that the TOC is not an exact point at which cumulative watershed effects will occur, or even that measureable effects will occur at all, it is merely a warning that cumulative effects might occur.

Assumptions and Limitations

- The ERA method is intended for watersheds between 3,000 and 10,000 acres in size, although it is commonly used for watersheds slightly outside of this range.
- ERA values, as well as the TOC, are only indicators of the risk of cumulative impacts occurring. They cannot be used to determine the percent or numerical amount of increase of sediment delivery to streams, stream channel eroded, fish habitat degraded or lost, or any other change in watershed condition.
- The location of land disturbance activities within a watershed is not considered. For example, roads near streams are treated exactly the same as roads that are far from streams. In reality, roads located near streams contribute more sediment to streams than roads in upland areas.

Risk Categories

- Low risk of CWE – ERA is less than 50 percent of TOC
- Moderate risk of CWE – ERA is 50 to 80 percent of TOC

- High risk of CWE – ERA is between 80 and 100 percent of TOC
- Very high risk of CWE – ERA is greater than 100 percent of TOC

Watersheds Impacted by the King Fire

The King Fire burned within 33 HUC7 watersheds (Table 1, Figure 1). Burn severity varied widely across the watersheds – see the Hydrology section of the EIS for further detail of burn severity within each watershed.

Table 1. Total Acres of Each HUC7 and Total Acres and Percent of Each HUC7 Within the Fire Perimeter. Hydrologic Unit Code identifiers are also presented.

HUC 7	HUC7 Total Area (acres)	HUC7 within Fire (acres)	HUC7 within Fire (%)
Big Grizzly Canyon (18020128020605)	6,222	2,252	52
Brush Creek (18020129050302)	5,215	5,215	100
French Meadows Reservoir (18020128010105)	6,222	58	1
Gerle Creek (18020128020303)	7,137	150	2
Headwaters Slab Creek (18020129050301)	8,697	6,431	74
Little Silver Creek (18020129040205)	8,581	151	2
Long Canyon – South Fork American River (18020129050305)	2,871	4	<1
Lower Pilot Creek (18020129050303)	9,823	234	2
Lower Silver Creek (18020129040403)	6,646	6,320	95
Lower Slab Creek (18020129050303)	5,496	5,297	96
Lower South Fork Rubicon River (18020128020305)	6,044	2,049	34
Middle Fork American River – Chipmunk Creek (18020128010106)	7,285	15	<1
Middle Long Canyon (18020128020404)	6,142	762	12
North Fork Long Canyon Creek (18020128020402)	4,197	676	16
One Eye Creek (18020129050105)	4,523	7	<1
Onion Creek (18020129040402)	3,351	2,944	88
Pilot Creek – Stumpy Meadows Reservoir (18020128020501)	9,562	4,823	50
Rubicon River – Ellicott Bridge (18020128020601)	7,966	7,403	93
Rubicon River – Hell Hole Reservoir (18020128020206)	11,268	777	7
Rubicon River – Leonardi Springs (18020128020603)	7,140	7,139	100

HUC 7	HUC7 Total Area (acres)	HUC7 within Fire (acres)	HUC7 within Fire (%)
Rubicon River – Pigeon Roost Canyon (18020128020604)	7,077	4,824	68
Rubicon River – Stoney Creek (18020128020602)	7,305	5,740	79
Silver Creek – Camino Reservoir (18020129030205)	12,344	10,152	82
Soldier Creek (18020129030205)	3,563	3,293	92
South Fork American River – Brockliss Canyon (18020129030204)	11,082	1,056	10
South Fork American River – Fresh Pond (18020129030206)	7,026	4,667	66
South Fork American River – Slab Creek Res. (18020129050304)	6,722	4,473	67
South Fork Long Canyon Creek (18020128020401)	7,121	4,442	62
South Fork Silver Creek – Junction Reservoir (18020129040303)	11,521	<1	<1
Upper Chile (18020129050307)	8,306	<1	<1
Upper Gerle Creek (18020128020302)	7,941	39	<1
Wallace Canyon (18020128020403)	8,353	5,957	71
Whaler Creek (18020129050101)	8,306	61	1

Methodology Specific to the King Fire Salvage Project

Current Conditions

Recovery of a watershed from land-disturbing activities occurs with time. For timber harvest activities, hydrologic recovery is assumed to be 30 years (i.e., ERA contribution is 0-30 years after timber harvest). A three-year average recovery period was used for areas of moderate soil burn severity, and a seven-year average recovery period was used for areas of high soil burn severity. Note that these are the same values used for CWE analysis on the Rim Fire (Stanislaus National Forest and Yosemite National Park) and the American Fire (Tahoe National Forest) salvage logging projects, both of which are located nearby the King Fire in areas with similar watershed and climate characteristics. It was assumed that areas of low burn severity would have a similar watershed response as unburned areas. The ERA calculations do not take into account site-specific BMPs that would be applied. ERA values start one year after a land use is implemented.

Cumulative watershed effects for Alternative 5 are the same as for Alternative 2 as differences in the proposed actions between Alternative 2 and Alternative 5 are negligible in terms of cumulative watershed impacts.

For non-National Forest System Lands it was assumed that all areas with 10 percent or more vegetation mortality would be treated through mechanical salvage/biomass removal, except for plantations established within the past 10 years, which would not require treatment.

All activities on Forest Service land within the HUC7 watersheds affected by proposed project activities of the King Fire Restoration Project were updated using the Forest Service Activity Tracking System (FACTS) database. The most recent, most impactful treatment was used to calculate existing treatment

activities. Some treatments may overlap despite efforts to minimize double counting treatments on acres where compounding effects from treatment were likely, such as counting two thins on the same acre accounted for in FACTS as different accomplishments for the same time period, or a clear cut followed by a thin 20 years later. Where high or moderate severity fire effects to soil resulted, that was considered the most impactful treatment. Existing landings and skid roads in areas of high severity fire effects were assumed to continue to have an impact and were retained in the worksheets for each HUC 7 watershed.

All activities on non-National Forest System land ownerships in the HUC7 watersheds affected by proposed project activities on the King Fire Restoration Project were determined using CALFire Timber Harvest Plan (THP) data. Some treatments may overlap in these treatments, such as a thinning that was later clear cut or thinned again. Again, high and moderate severity fire effects to soil were assumed to be the most impactful treatment when calculating current watershed conditions.

All existing roads and trails were included in the worksheet. Range allotments were not updated due to time limitations and the overwhelming impact of the fire relative to impacts from grazing.

Future Conditions

The most recent Schedule of Proposed Actions was used to determine proposed activities on NFS lands, and the FACTS database was used to determine how many activities from past projects on NFS lands have yet to be completed. The estimation of number of new landings to be constructed, as calculated by the ERA spreadsheets, was reduced by 66 percent due to re-use of existing landings.

For non-National Forest System lands it was assumed that all areas with 10 percent or more vegetation mortality would be treated through mechanical salvage/biomass removal, except for plantations established within the past 10 years, which would not require treatment.

Watersheds Excluded from Analysis

Eleven of the 33 watersheds had less than two percent of the total area impacted by the fire, and therefore were not analyzed due to the small acreage within the fire perimeter. In addition, the Onion Creek Watershed was also excluded from analysis as it contains no Forest Service land and therefore has no proposed activities under this project. The following watersheds were excluded from further analysis:

- French Meadows Reservoir
- Gerle Creek
- Little Silver Creek
- Long Canyon – South Fork American River
- Lower Pilot Creek
- Middle Fork American River – Chipmunk Creek
- One Eye Creek
- Onion Creek
- South Fork Silver Creek – Junction Reservoir
- Upper Chile
- Upper Gerle Creek
- Whaler Creek

Summary of Results

The ERA model was run for the years 2015, 2016, 2020, and 2025. The results of ERA analysis, expressed as the percentage of the TOC, are presented in Table 2. When the percentage of TOC is 100 percent or greater, that watershed has a very high risk of CWE and is considered to be “over threshold.”

Table 2 and Figure 2 present a summary of the number of watersheds that fall within each risk category by alternative for each year analyzed. Watersheds over threshold are highlighted in grey in Table 2, and colored red in Figure 2.

In general, there is little difference in the number of watersheds over threshold between the alternatives for each year of interest, despite substantial differences in the extent of ground-disturbing treatment activities in some watersheds. These results are consistent with the results of Chou et al. (1994) and McIver and Star (2001), who found no differences in sediment output between logged and unlogged burned areas, which they suggested was because sediment produced from logging was overwhelmed by sediment produced from the fire itself. The results of the King Fire CWE analysis also agree with Peterson et al. (2009), who, in a synthesis of the effects of post-fire logging in western North America, suggested that because post-fire logging takes place in areas where the canopy and soil have already been modified, it is reasonable to conclude that logging would not add significantly to the already altered landscape.

Table 2. Equivalent Roaded Acres Expressed as the Percentage of the TOC for HUC7 Watersheds Impacted by the Fire for Each Alternative During 2015, 2016, 2020, and 2025.

When the percentage of TOC is 100 percent or greater, that watershed has a very high risk of CWE and is considered to be "over threshold." Watersheds over threshold are highlighted in grey.

HUC 7	Alt	2015 % TOC	2016 % TOC	2020 % TOC	2025 % TOC
Big Grizzly Canyon *TOC = 14 percent*	1	209	171	139	126
	2		225	177	154
	3		225	177	154
	4		228	179	156
Brush Creek *TOC = 14 percent*	1	183	126	72	46
	2		161	95	64
	3		149	86	57
	4		172	104	72
Headwaters Slab Creek *TOC = 10 percent*	1	187	308	161	136
	2		308	190	136
	3		307	189	136
	4		308	190	136
Lower Silver Creek *TOC = 12 percent*	1	185	132	64	32
	2		152	78	45
	3		136	67	36
	4		161	87	54
Lower Slab Creek *TOC = 10 percent*	1	85	139	106	87
	2		147	111	92
	3		142	108	89
	4		168	127	105
Lower South Fork Rubicon River *TOC = 10 percent*	1	41	40	32	27
	2		41	32	27
	3		40	32	27
	4		47	37	31

HUC 7	Alt	2015 % TOC	2016 % TOC	2020 % TOC	2025 % TOC
Middle Long Canyon *TOC = 14 percent*	1	35	46	51	47
	2		46	52	48
	3		46	52	48
	4		46	52	48
North Fork Long Canyon Creek *TOC = 14 percent*	1	65	61	52	47
	2		61	52	47
	3		61	52	47
	4		62	53	47
Pilot Creek – Stumpy Meadows Reservoir *TOC = 16 percent*	1	123	112	87	65
	2		119	96	85
	3		117	94	84
	4		119	96	85
Rubicon River – Ellicott Bridge *TOC = 10 percent*	1	216	150	62	20
	2		170	75	32
	3		168	74	30
	4		173	78	33
Rubicon River – Hell Hole Reservoir *TOC = 12 percent*	1	19	18	15	14
	2		19	16	14
	3		19	16	14
	4		19	16	14
Rubicon River – Leonardi Spring *TOC = 10 percent*	1	419	356	296	289
	2		428	335	293
	3		418	328	287
	4		449	351	307
Rubicon River – Pigeon Roost Canyon *TOC = 10 percent*	1	155	139	112	100
	2		155	122	107
	3		153	121	106
	4		154	122	108
Rubicon River – Stony Creek *TOC = 14 percent*	1	212	193	160	142
	2		202	166	146
	3		202	166	151
	4		210	172	152
Silver Creek – Camino Reservoir *TOC = 10 percent*	1	163	199	124	89
	2		193	130	102
	3		179	121	94
	4		208	143	114
Soldier Creek *TOC = 12 percent*	1	227	227	119	78
	2		196	113	76
	3		186	107	72
	4		198	117	80
South Fork American River – Brockliss Canyon *TOC = 10 percent*	1	88	88	72	62
	2		82	69	61
	3		82	69	61
	4		85	71	63

HUC 7	Alt	2015 % TOC	2016 % TOC	2020 % TOC	2025 % TOC
South Fork American River – Fresh Pond Ravine *TOC = 10 percent*	1	177	167	96	63
	2		151	93	66
	3		150	93	66
	4		157	97	70
South Fork American River – Slab Creek Reservoir *TOC = 10 percent*	1	138	137	108	95
	2		156	118	102
	3		147	112	97
	4		173	133	114
South Fork Long Canyon Creek *TOC = 16 percent*	1	83	93	71	62
	2		98	74	64
	3		96	73	63
	4		102	78	67
Wallace Canyon *TOC = 14 percent*	1	232	198	159	140
	2		259	201	175
	3		251	195	170
	4		260	202	176

Table 3. Number of HUC7 Watersheds That Fall Within Each Risk Category by Each Alternative for 2015, 2016, 2020, and 2025, as Calculated from the ERA Methodology

Year	Alternative	Low Risk	Moderate Risk	High Risk	Very High Risk (over threshold)
2015	All	3	2	2	14
2016	1	3	1	2	15
	2	3	1	2	15
	3	3	1	2	15
	4	3	1	1	16
2020	1	2	7	3	9
	2	2	6	4	9
	3	2	6	4	9
	4	2	5	4	10
2025	1	7	5	2	7
	2	6	5	1	9
	3	6	5	3	7
	4	5	6	1	9

Results for Each Alternative

Alternative 1

In 2015, 14 of the 21 watersheds analyzed had a very high risk (over threshold) of CWEs under all alternatives (Figure 3) as a result of the fire itself and past and present activities on public and private land.

The watersheds over threshold are:

- Big Grizzly Canyon
- Brush Creek
- Headwaters Slab Creek
- Lower Silver Creek
- Pilot Creek – Stumpy Meadows Reservoir
- Rubicon River – Ellicott Bridge
- Rubicon River – Leonardi Springs
- Rubicon River – Pigeon Roost Canyon
- Rubicon River – Stoney Creek
- Silver Creek – Camino Reservoir
- Soldier Creek
- South Fork American River – Fresh Pond Ravine
- South Fork American River – Slab Creek Reservoir
- Wallace Canyon

In 2016, the number of watersheds with a very high risk increases to 15 (addition of Lower Slab Creek) under Alternative 1 (Figure 4) due to a combination of the impacts of the fire itself and salvage logging on private land. The number of watersheds with a very high risk under Alternative 1 decreases in 2020 (Figure 5) due to recovery of burned areas and areas of private land that were salvage logged. The following watersheds remain over threshold in 2020:

- Big Grizzly Canyon
- Headwaters Slab Creek
- Lower Slab Creek
- Rubicon River – Ellicott Bridge
- Rubicon River – Leonardi Springs
- Rubicon River – Pigeon Roost Canyon
- Rubicon River – Stoney Creek
- Silver Creek – Camino Reservoir
- Soldier Creek
- South Fork American River – Slab Creek Reservoir
- Wallace Canyon

In 2025, one watershed (Silver Creek – Camino Reservoir) is no longer over threshold (Figure 6); the other watersheds listed for 2020 remain over threshold in 2025.

The results of CWE analysis for Alternative 1 demonstrate that the fire itself and salvage logging on private land caused multiple watersheds to be over threshold and have a high risk of cumulative watershed effects.

Alternative 2

For the years 2015 (Figure 7), 2016 (Figure 8), and 2020 (Figure 9), the same watersheds remain over threshold as under Alternative 1 (No Action) despite the proposed addition of potentially ground-disturbing treatments on 17,227 acres (Table 2.1 of the DEIS). This is likely the result of sediment produced from post-fire logging activities being overwhelmed by sediment produced by the fire itself, which is supported by the results of Chou et al. (1994), McIver and Star (2001) and Peterson et al. (2009).

In 2025, two watersheds remain over threshold (Silver Creek – Camino Reservoir and South Fork American River – Slab Creek Reservoir) as compared to Alternative 1 (although both of these watersheds exceed the TOC by only 2%). This is likely in response to quicker recovery times for fire compared to salvage logging.

Alternative 3

The same watersheds over threshold under Alternative 1 (No Action) remain over threshold under Alternative 3 for all years of analysis (Figures 10-12).

Compared to Alternative 2 (Proposed Action), Alternative 3 reduces the amount of land to be logged with fairly large reductions in some watersheds. However, cumulative effects are expected to be similar, which is supported by studies that concluded that sediment production from post-fire logging is overwhelmed by sediment produced by the fire itself (Chou et al. 1994; McIver and Star 2001; Peterson et al. 2009).

Alternative 4

Compared to Alternative 1 (No Action), the same watersheds are over threshold under Alternative 4 in 2015 (Figure 3). In 2016, one additional watershed remains over threshold (South Fork Long Canyon Creek, Figure 13) compared to Alternative 1. One additional watershed remains over threshold in 2020 compared to Alternative 1 (Brush Creek, Figure 14). In 2025, one additional watershed remains over threshold (Lower Slab Creek, Figure 15) compared to Alternative 1. In all cases, these watersheds are over the TOC by five percent or less.

Compared to Alternative 2 (Proposed Action), Alternative 4 increases the amount of land to be logged with fairly high increases in some watersheds. However, cumulative effects are expected to be similar, which is supported by studies that concluded that sediment production from post-fire logging is overwhelmed by sediment produced by the fire itself (Chou et al. 1994; McIver and Star 2001; Peterson et al. 2009).

Alternative 5

Cumulative watershed effects were not assessed separately for Alternative 5 as the reduction in herbicide use would not impact hydrologic response at the HUC7 watershed scale. Therefore, cumulative watershed impacts would be the same as those described for Alternative 2.

Figure 1. HUC7 Watersheds in Which the King Fire Burned

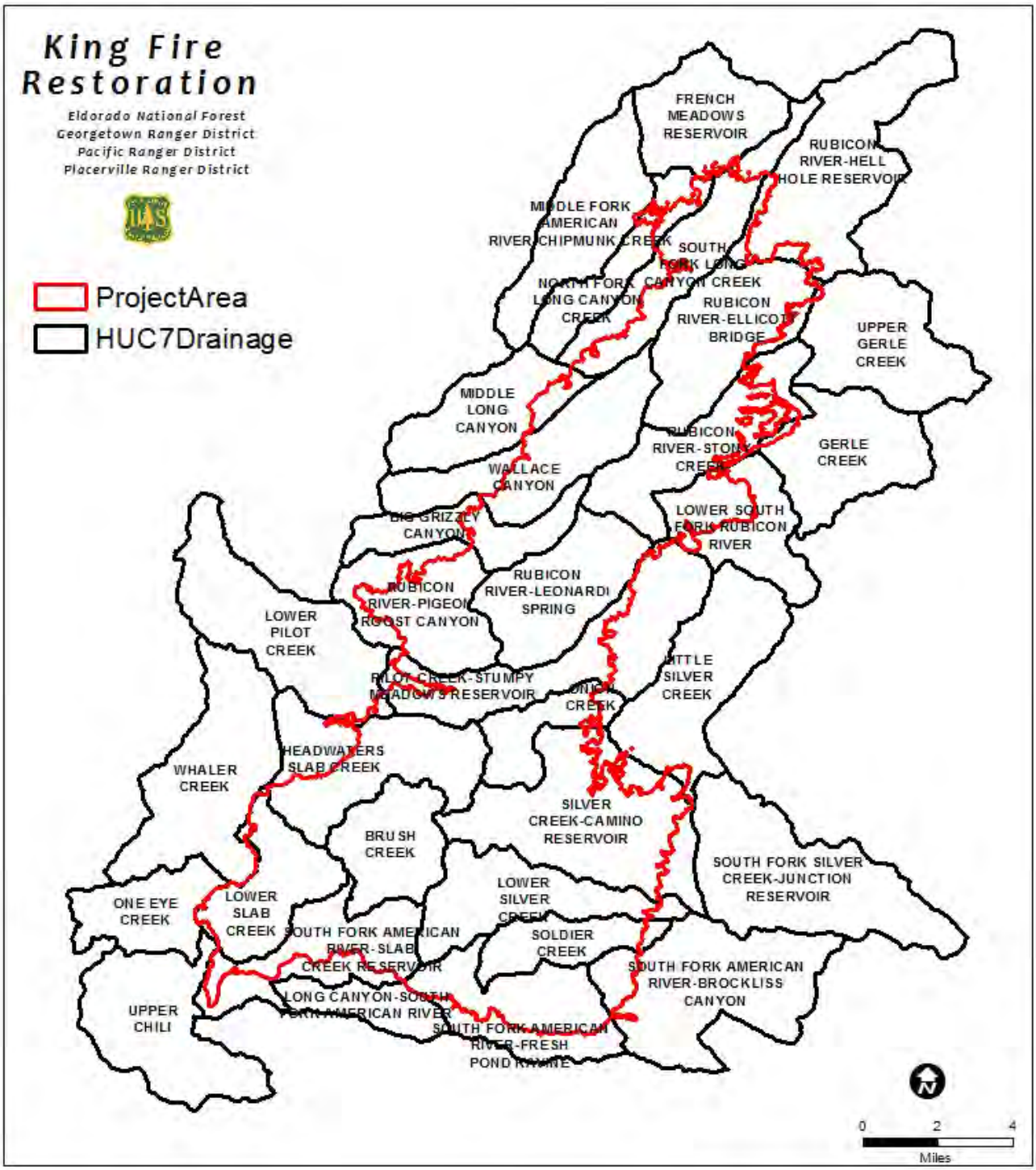


Figure 2. Number of Watersheds Within Each Risk Category for Cumulative Watershed Effects by Alternative for the Years 2015, 2016, 2020, and 2025

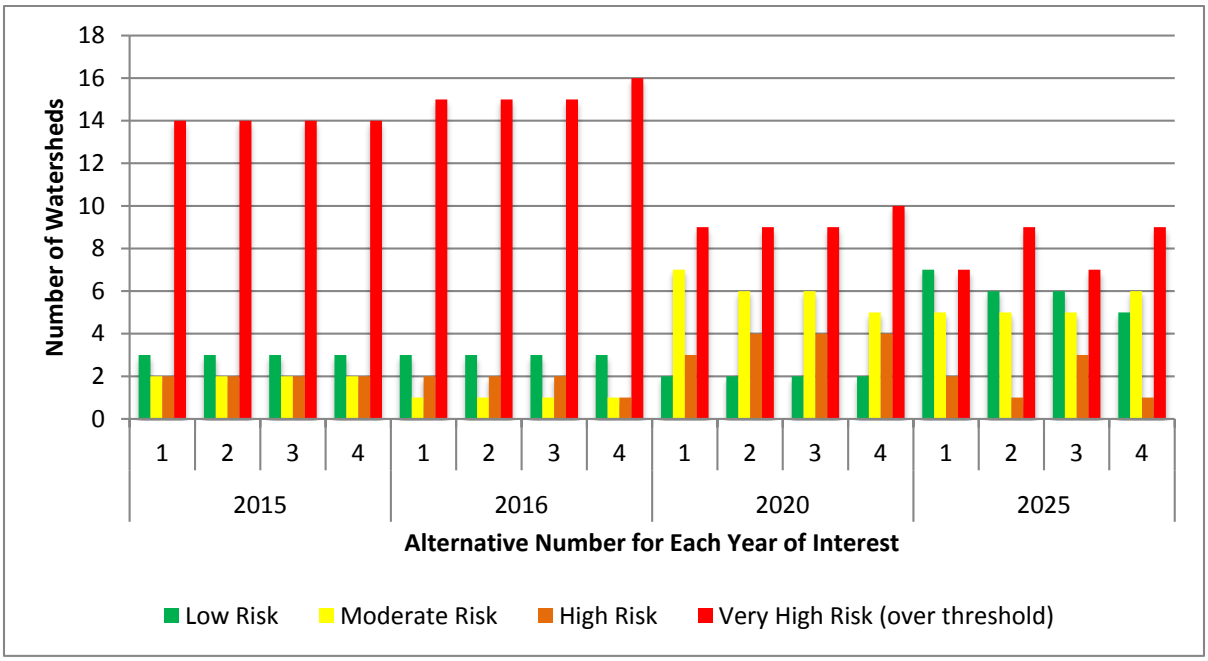


Figure 3. Risk of CWE in 2015 for All Alternatives

Watersheds In Red Are Considered To Be "Over Threshold."

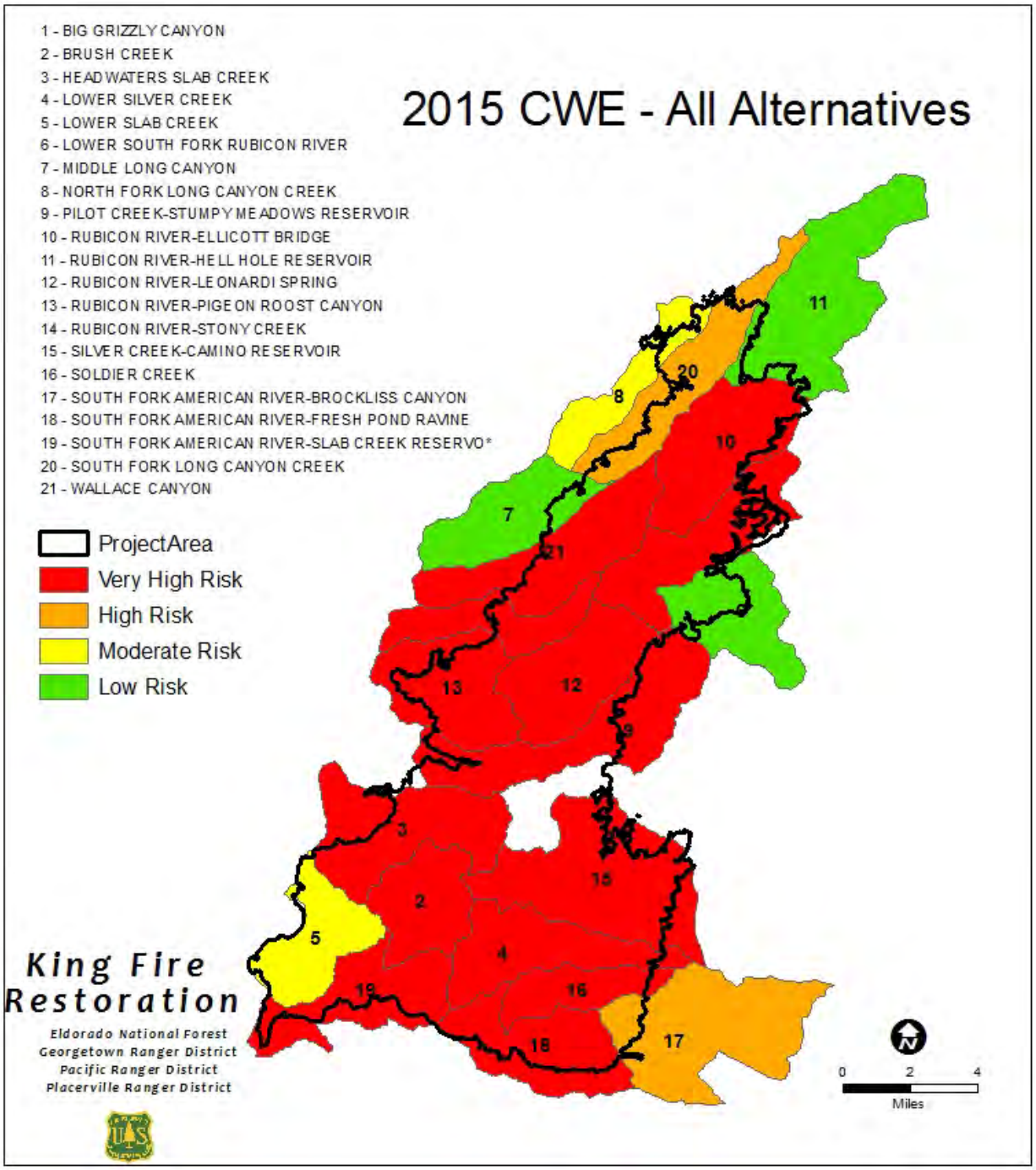


Figure 4. Risk of CWE in 2016 for Alternative 1 (No Action)

Watersheds in red are considered to be "over threshold."

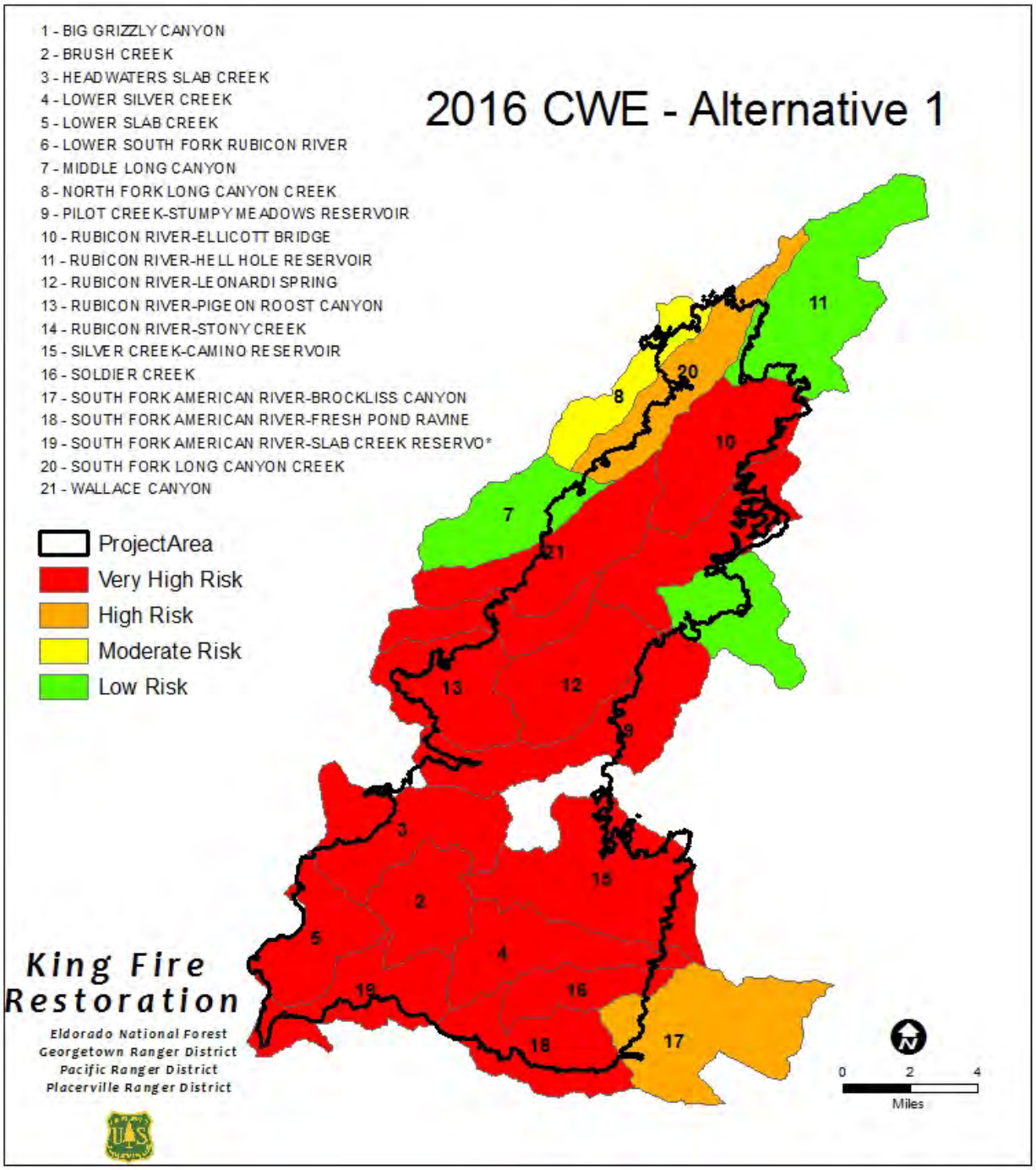


Figure 5. Risk of CWE in 2020 for Alternative 1 (No Action)

Watersheds in red are considered to be "over threshold."

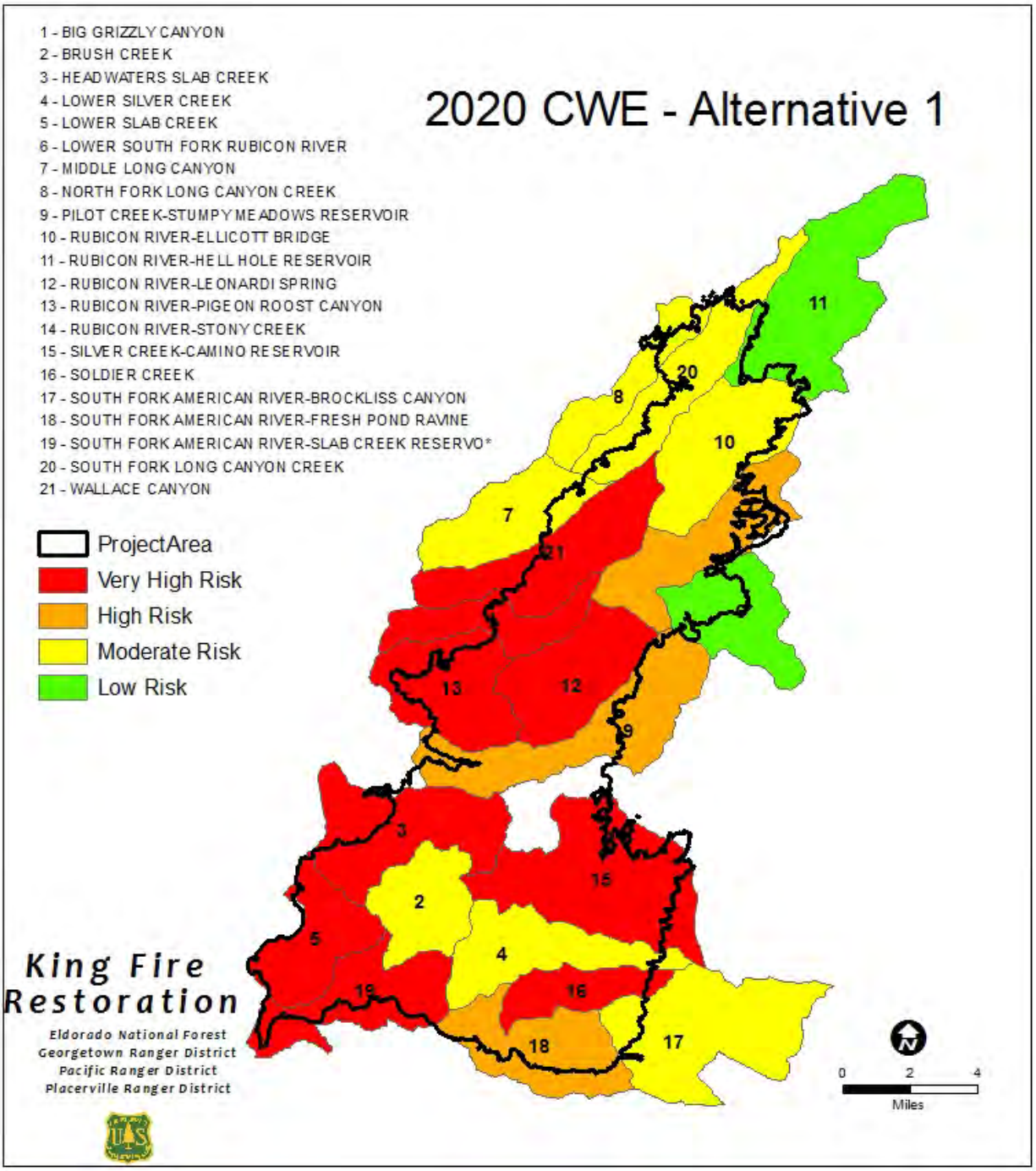


Figure 6. Risk of CWE in 2025 for Alternative 1 (No Action)

Watersheds in red are considered to be "over threshold."

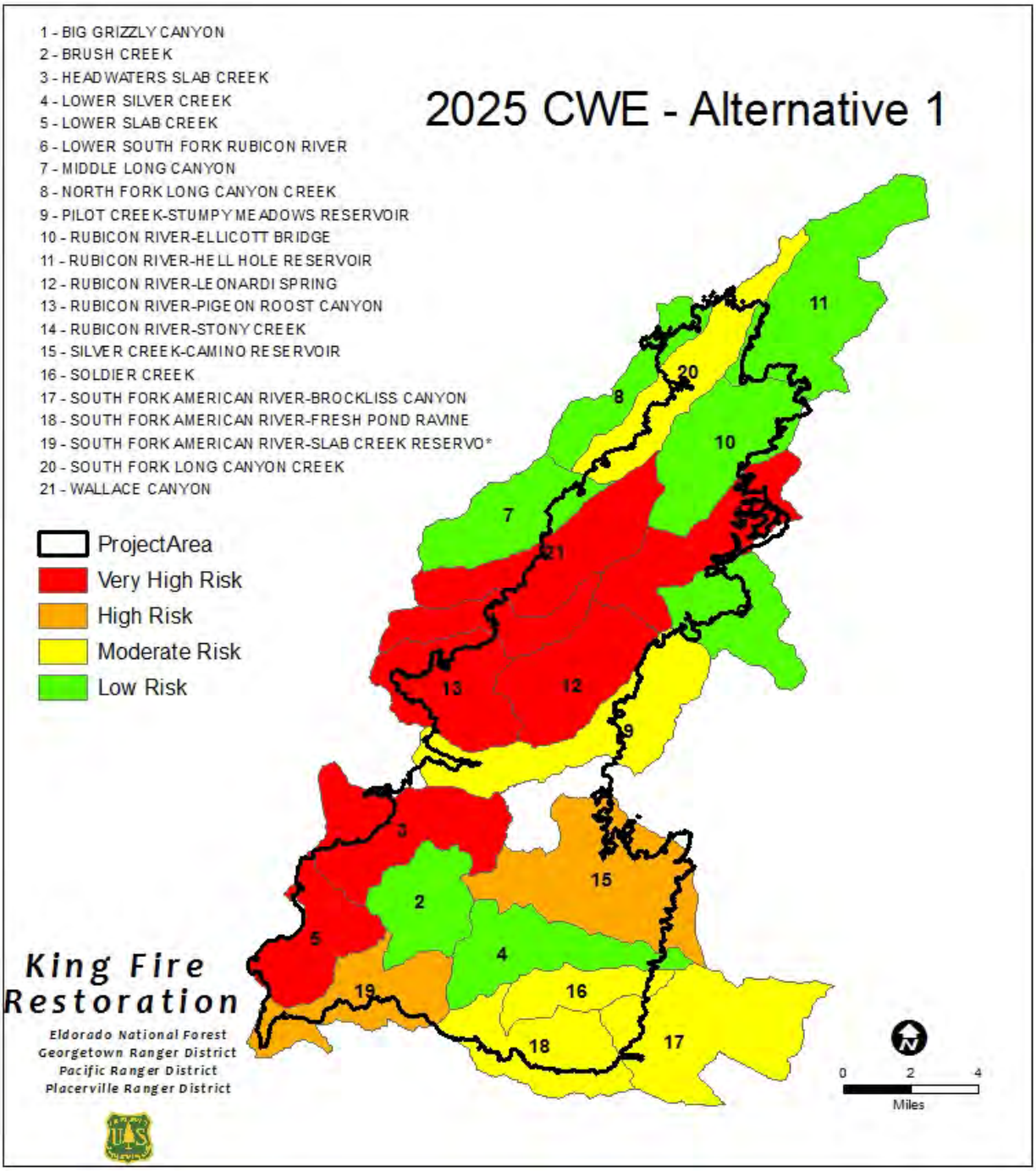


Figure 7. Risk of CWE in 2016 for Alternative 2 (Proposed Action)

Watersheds in red are considered to be "over threshold."

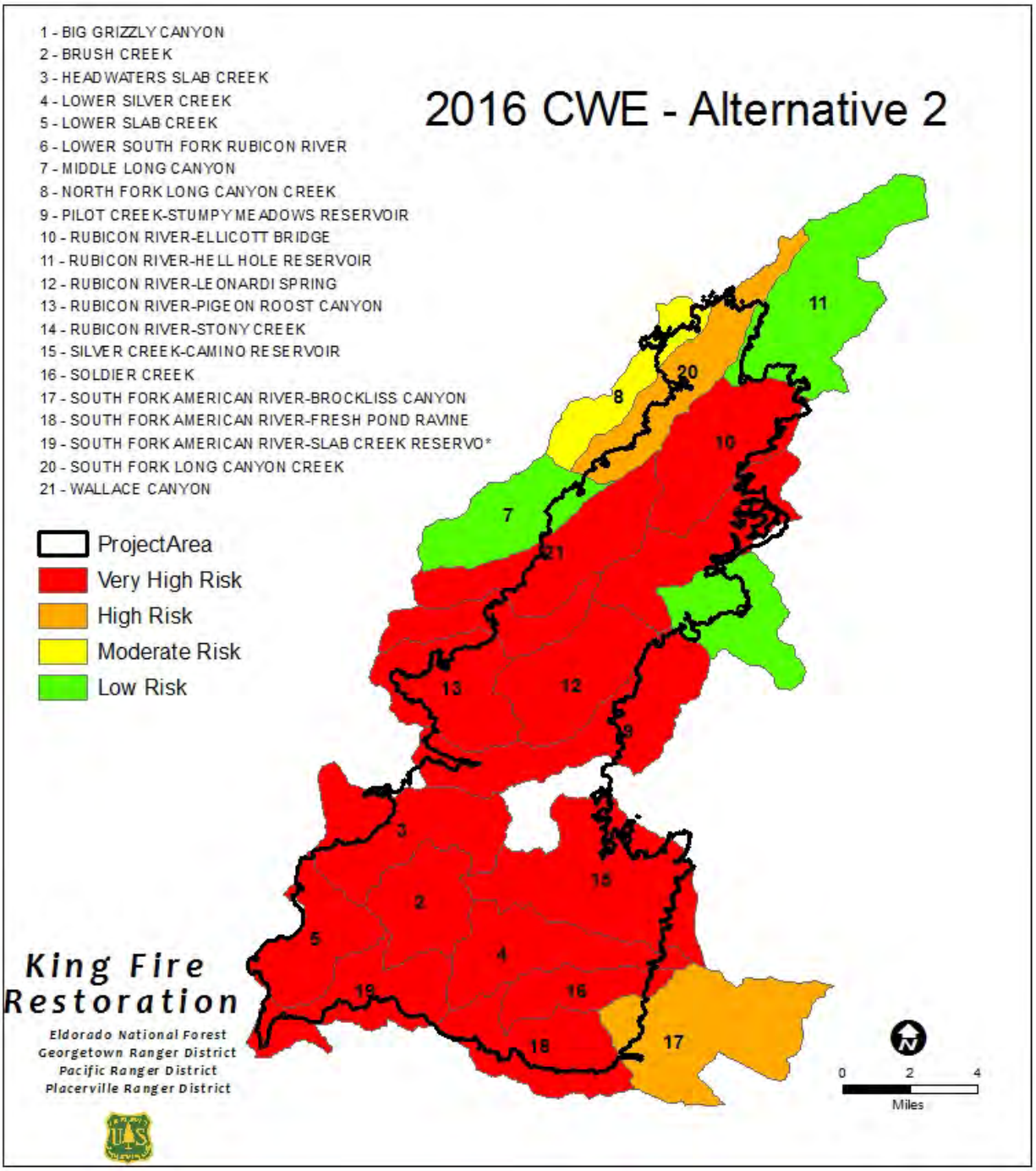


Figure 8. Risk of CWE in 2020 for Alternative 2 (Proposed Action)

Watersheds in red are considered to be "over threshold."

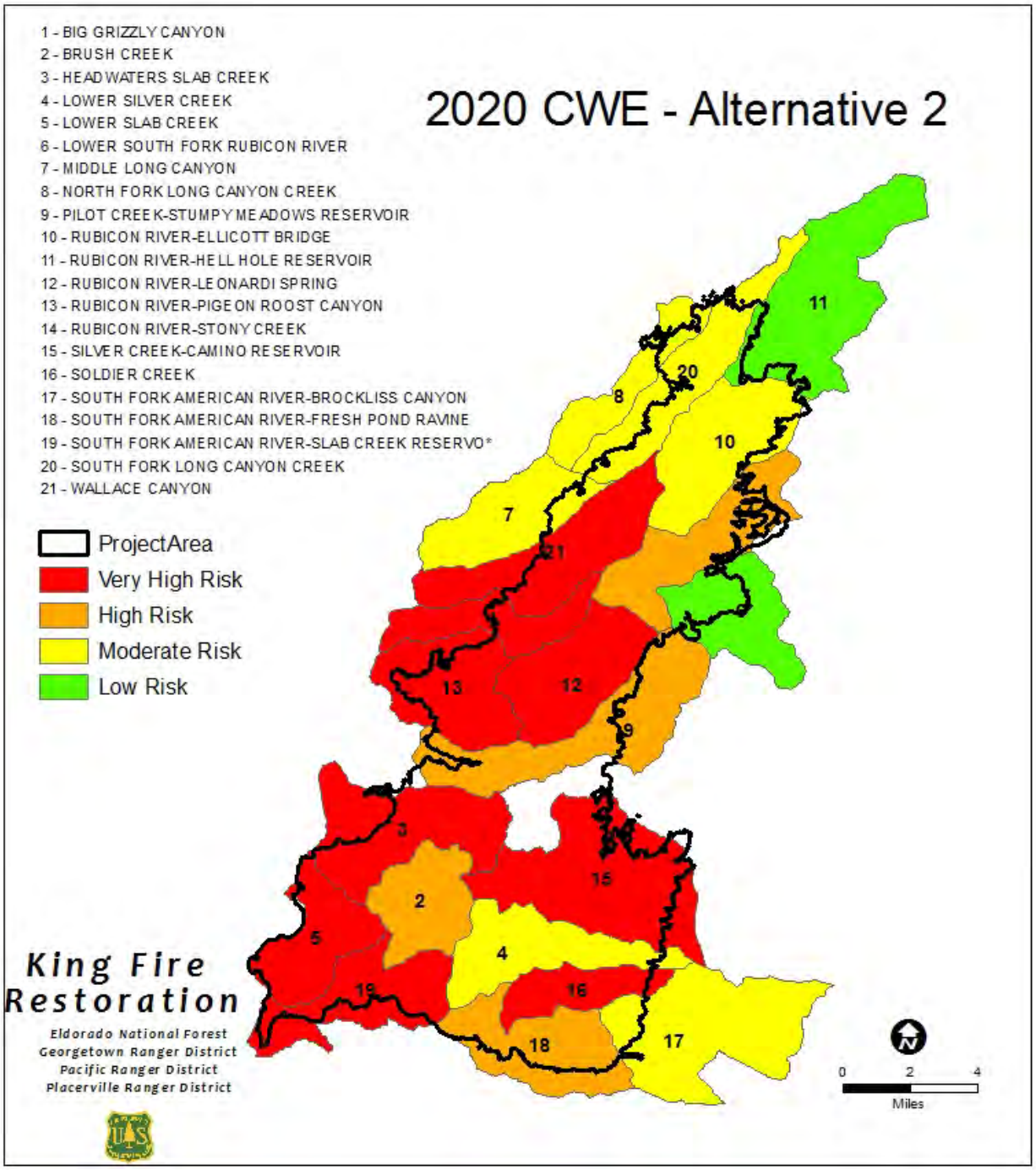


Figure 9. Risk of CWE in 2025 for Alternative 2 (Proposed Action)

Watersheds in red are considered to be "over threshold."

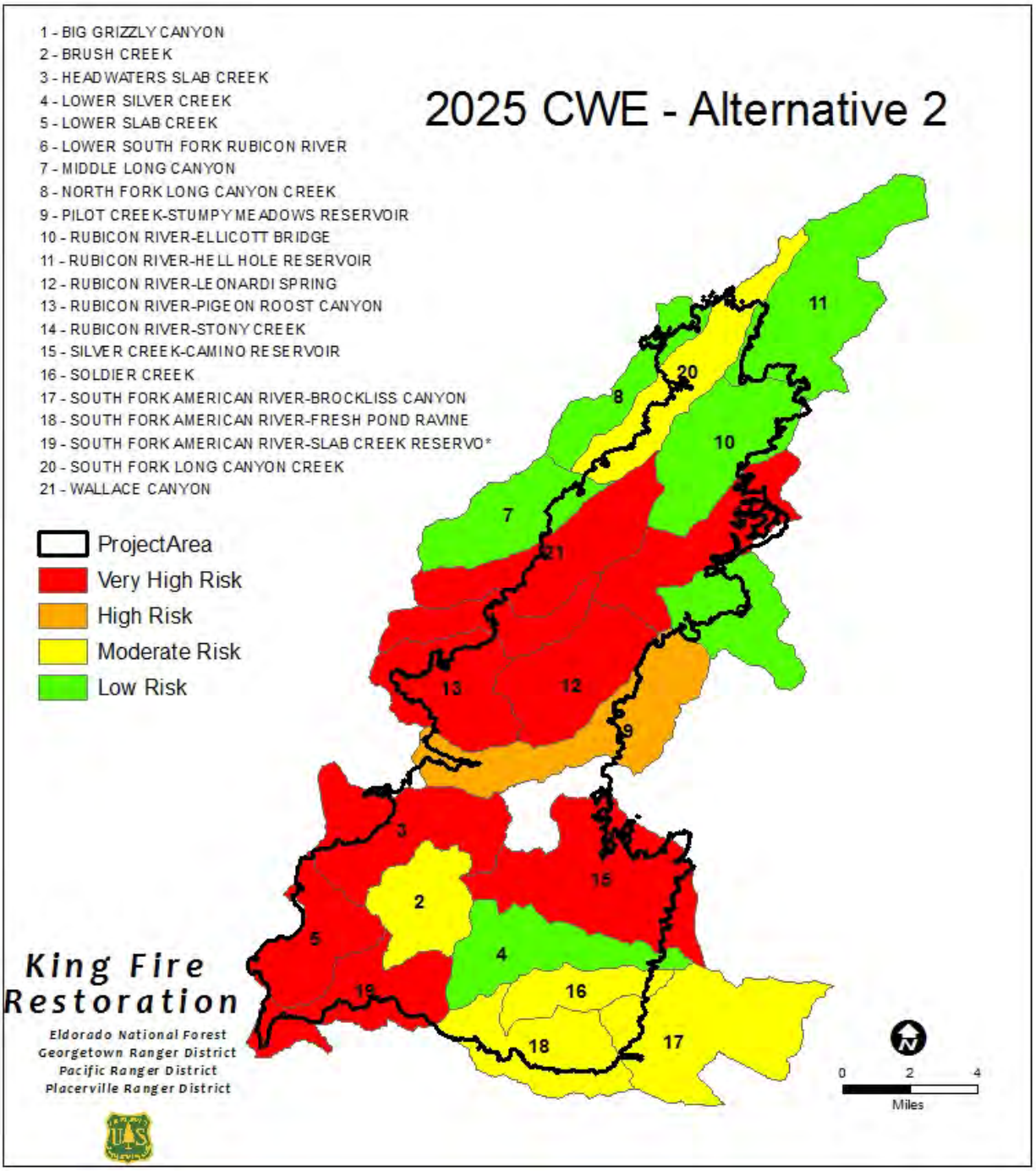


Figure 10. Risk of CWE in 2016 for Alternative 3

Watersheds in red are considered to be "over threshold."

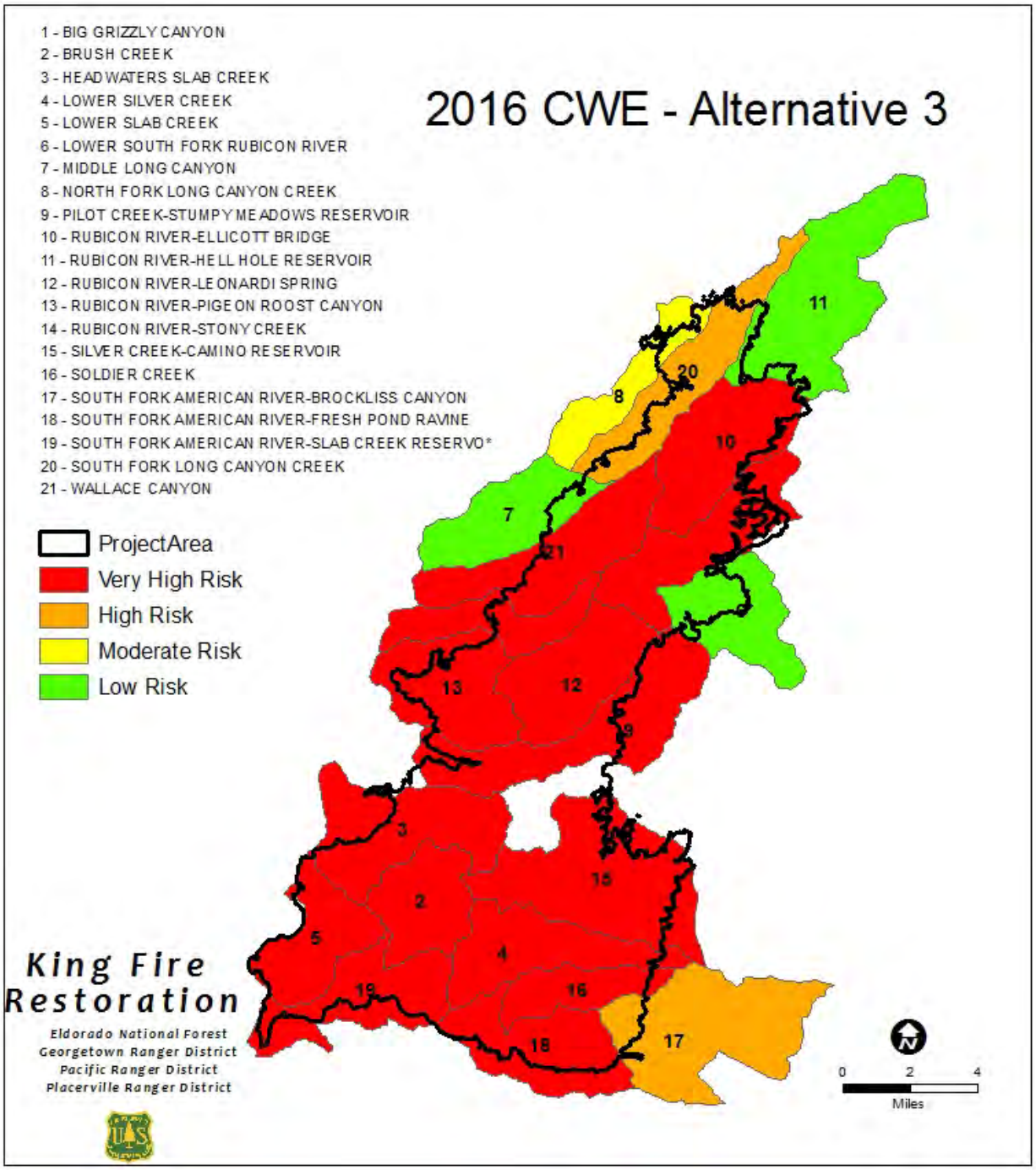


Figure 11. Risk of CWE in 2020 for Alternative 3

Watersheds in red are considered to be "over threshold."

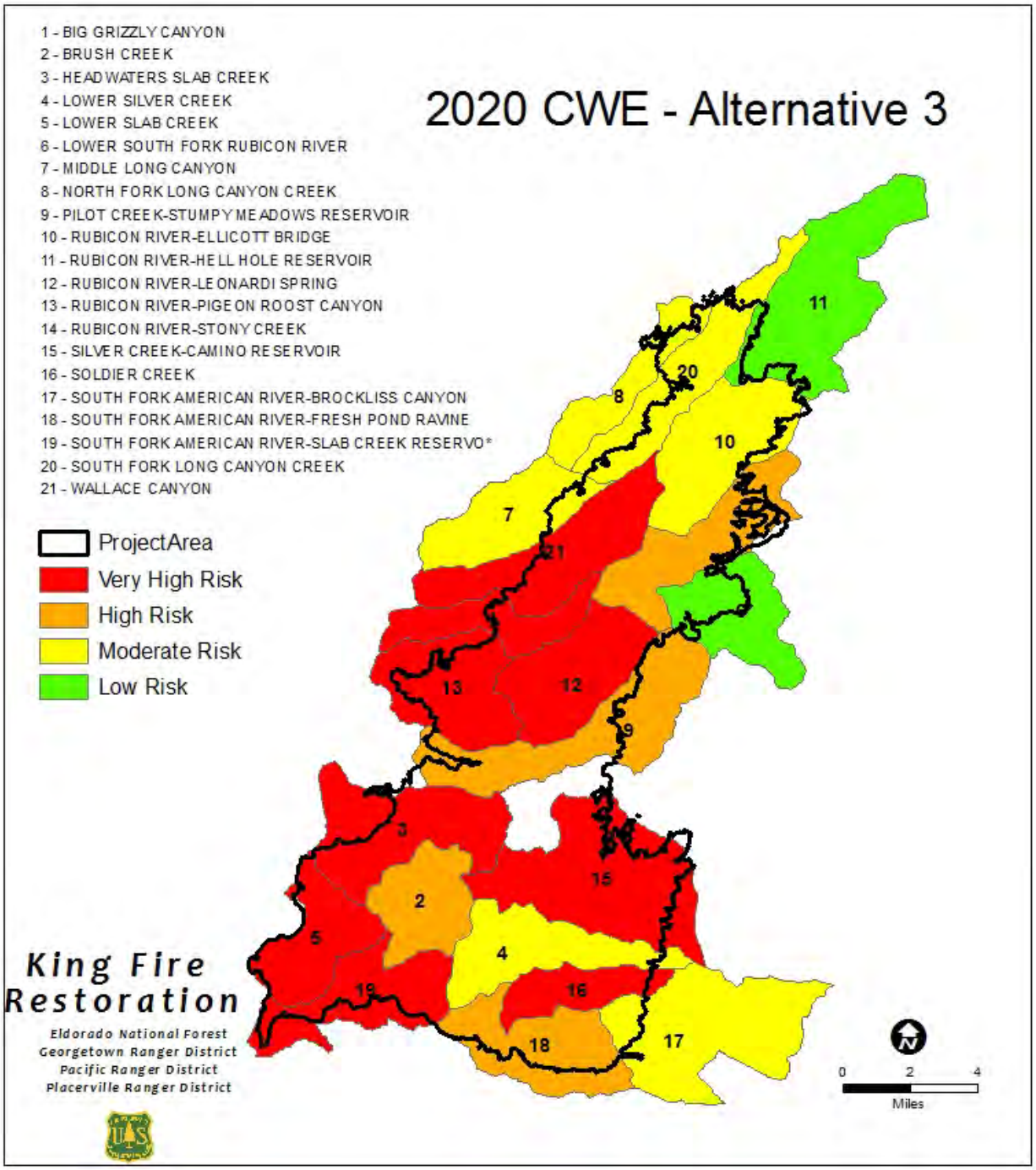


Figure 12. Risk of CWE in 2025 for Alternative 3

Watersheds in red are considered to be "over threshold."

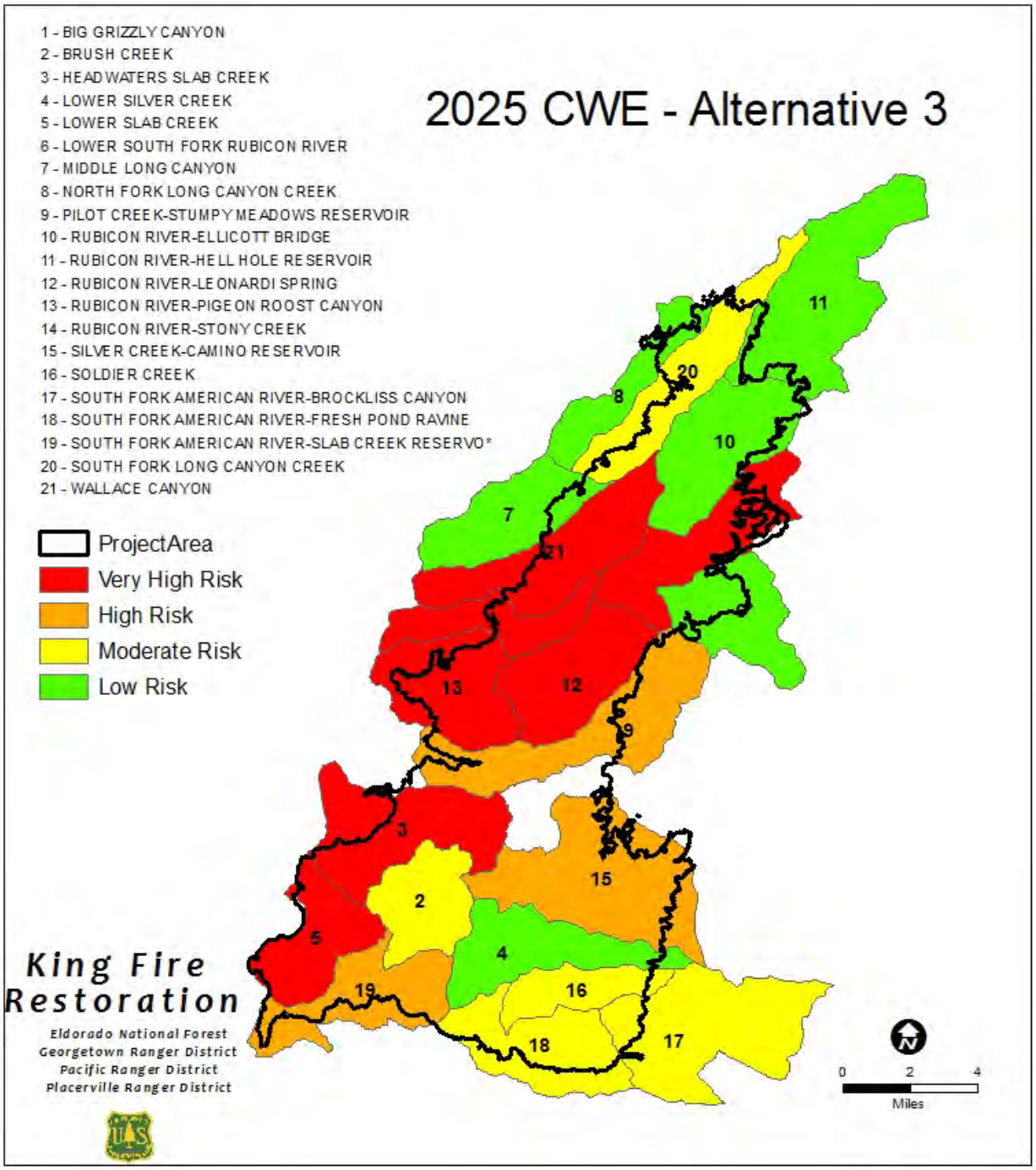


Figure 13. Risk of CWE in 2016 for Alternative 4

Watersheds in red are considered to be "over threshold."

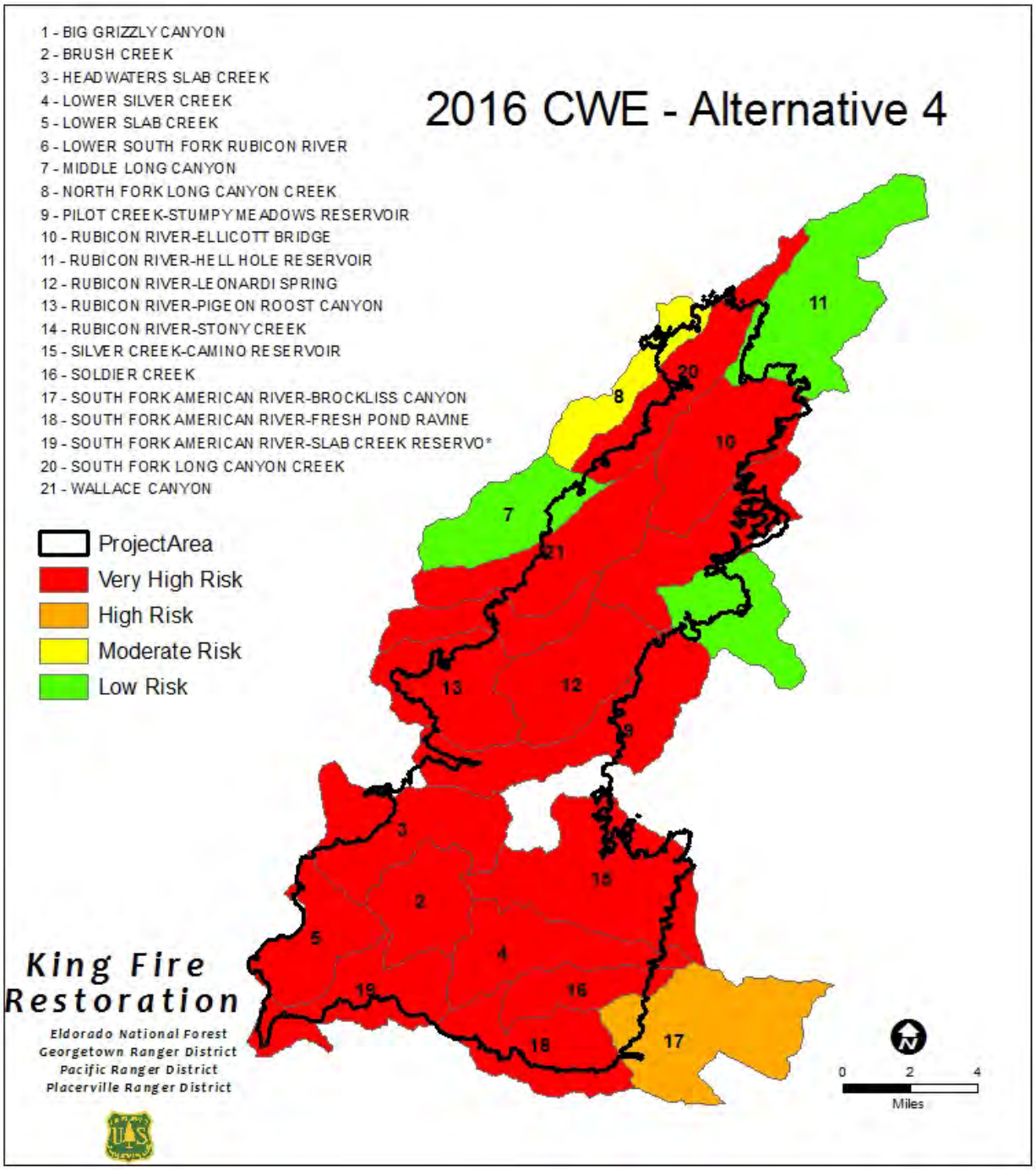


Figure 14. Risk of CWE in 2020 for Alternative 4

Watersheds in red are considered to be "over threshold."

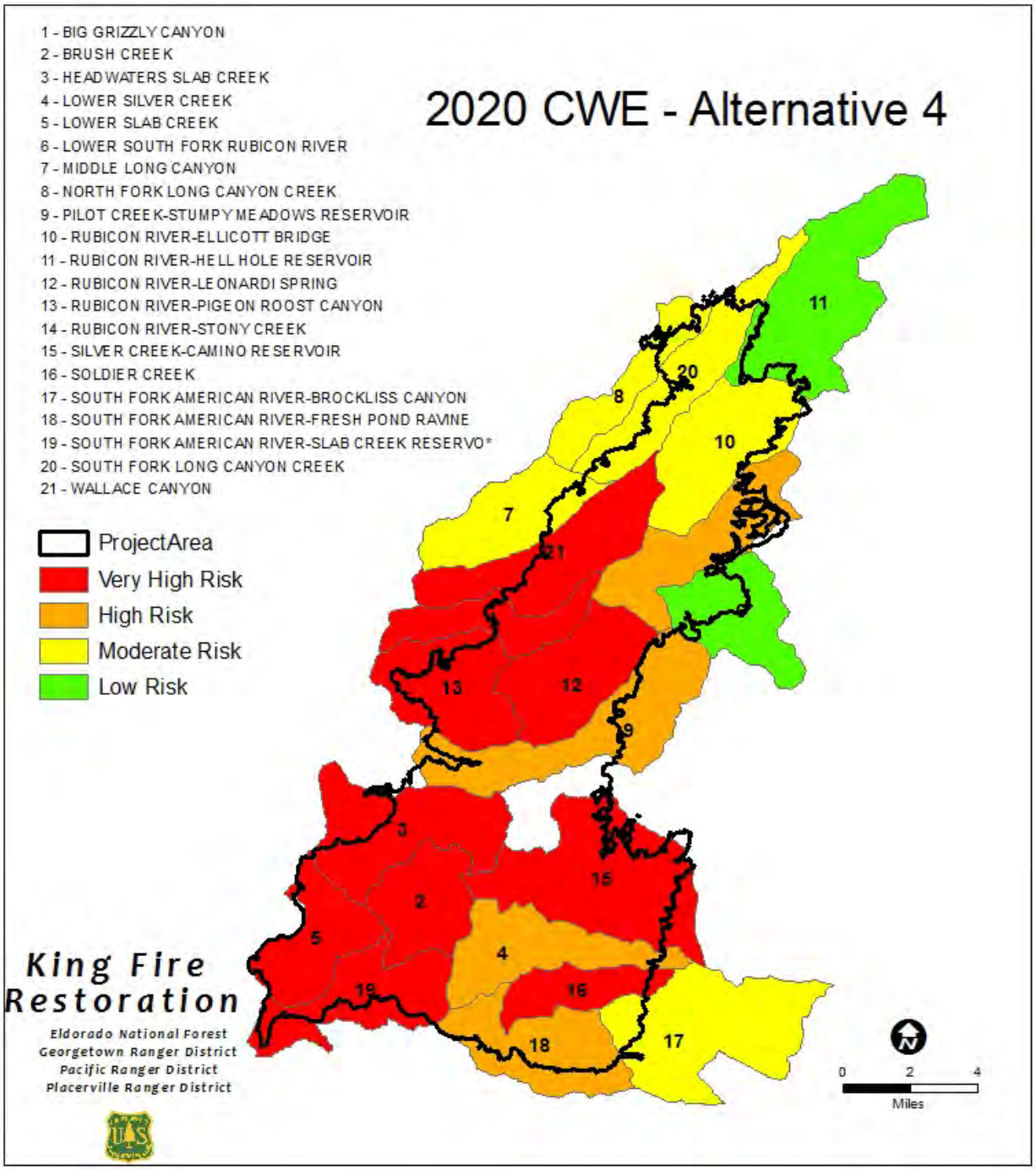
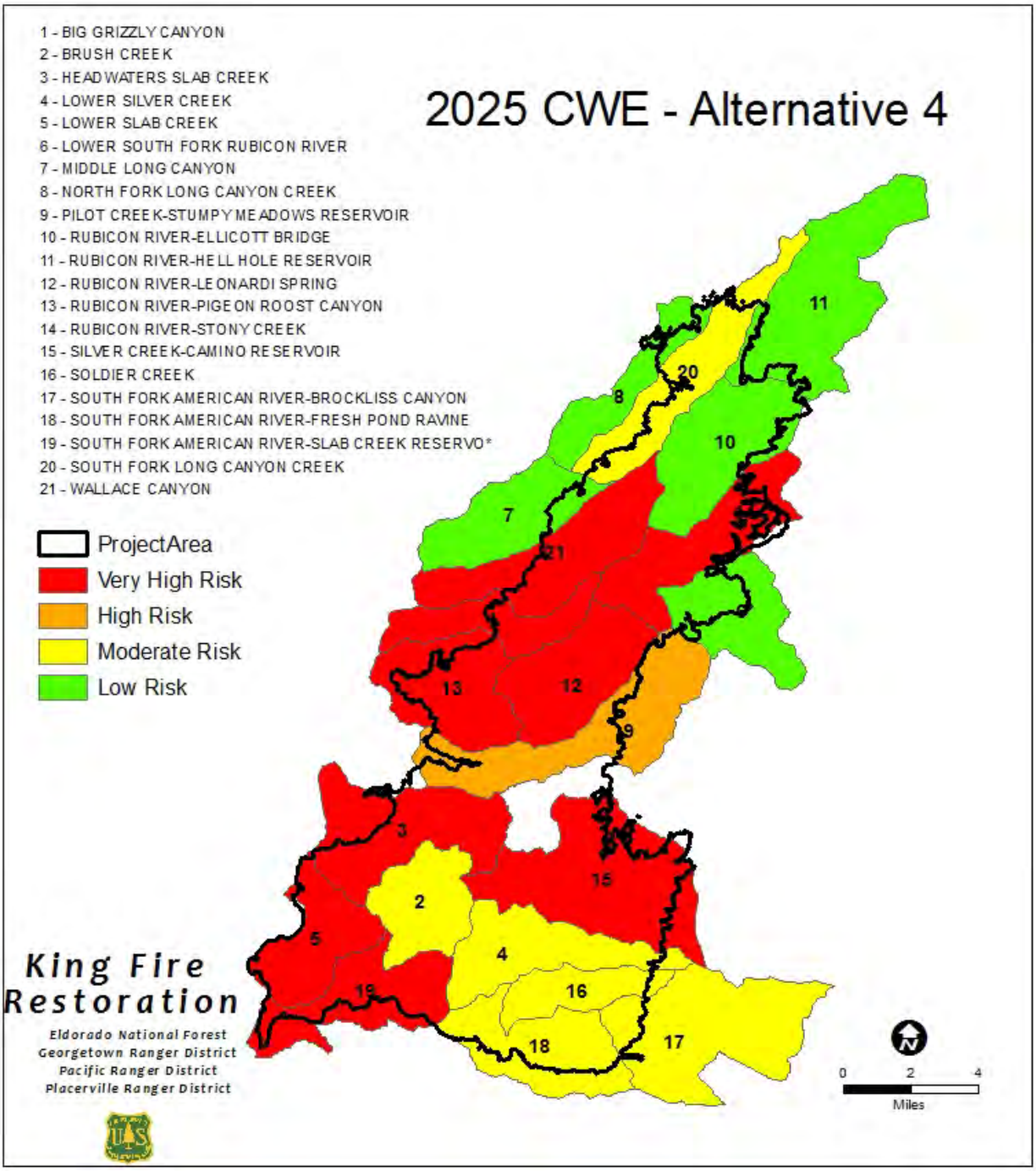


Figure 15. Risk of CWE in 2025 for Alternative 4

Watersheds in red are considered to be "over threshold."



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Carlson, J.Y. and C. Christiansen. 1993. Draft Eldorado National Forest CWE Analysis Process.

Chou, Y.H., S.G. Conard, and P.M, Wohlgemuth. 1994. Analysis of post-fire logging, watershed characteristics, and sedimentation in the Stanislaus National Forest. Proceedings of ESRI users conference, pp 492-499.

McIver, J.D., and L. Starr. 2001. A Literature Review on the Environmental Effects of Post-fire Logging. Western Journal of Applied Forestry, 16, 159-168.

Peterson, D.L., J.K. Agee, G.H. Aplet, D.P. Dykstra, R.T. Graham, J.F. Lehmkuhl, D.S. Pilliod, D.F. Potts, R.F. Powers, and J.D. Stuart. 2009. Effects of timber harvest following wildfire in western North America. Gen. Tech. Rep. PNW-GTR-776. Portland, OR: US Department of Agriculture, Forest Service, Pacific Northwest Research Station. 51 p.

Watershed Monitoring Plan
King Fire Restoration Project
Eldorado National Forest

Vince Pacific
Hydrologist
April 8, 2015

Introduction

This document describes the Watershed Monitoring Plan for the King Fire Restoration Project. Project analysis identified a need to conduct monitoring within the project area to ensure that Water Quality Best Management Practices (BMPs) and management requirements are implemented and effective at protecting water quality.

Implementation, Effectiveness, and Forensic Monitoring

A Conditional Waiver of Waste Discharge Requirements for Discharges Relating to Timber Harvest Activities is issued to the Forest Service by the Central Valley Regional Water Quality Control Board (Water Board). These waivers are required for all timber harvest activities that will or will likely discharge waste that could affect the quality of the waters of the State.

In order to meet the conditions of the waiver, the Eldorado National Forest must conduct monitoring in accordance with the Monitoring and Reporting Program required by the Water Board under Order No. R5-2014-0144. This includes implementation, effectiveness, and forensic monitoring. Implementation monitoring would be required throughout all sale areas. Effectiveness and forensic monitoring would be required only in watersheds which exceed a threshold of concern (TOC), as determined during the cumulative watershed effects analysis. All monitoring results would be compiled and submitted to the Water Board as part of an Annual Report, due July 15th. Any violations of the waiver, such as a major road or skid trail failure, would be reported to the Water Board by telephone within 48 hours of detection. A written report regarding such violation(s) would be submitted within 14 days.

Implementation Monitoring

Implementation monitoring would be conducted throughout the sale area to determine if BMPs and management requirements have been properly put in place before the start of the winter period (November 15th through April 1st). This monitoring would be completed through the use of Water Quality BMP checklists. Completed checklists would be submitted along with sale area maps to the Water Board as part of the Annual Report.

Effectiveness Monitoring

Effectiveness monitoring would be conducted to determine whether hillslope conditions created by timber operations are resulting in instream conditions that comply with water quality objectives and protect instream beneficial uses of water, or if new sediment sources have developed. Effectiveness monitoring would be conducted as soon as possible following the winter period.

Effectiveness monitoring would be led by a hydrologist, soil scientist, and/or approved soil/hydrologic technician to determine if BMPs and management requirements were effective at preventing significant

pollution during the winter period. This monitoring would be required for the King Fire Restoration Project in the following watersheds that exceed the TOC:

- Big Grizzly Canyon
- Brush Creek
- Headwaters Slab Creek
- Lower Silver Creek
- Pilot Creek – Stumpy Meadows Reservoir
- Rubicon River – Ellicott Bridge
- Rubicon River – Leonardi Springs
- Rubicon River – Pigeon Roost Canyon
- Rubicon River – Stoney Creek
- Silver Creek – Camino Reservoir
- Soldier Creek
- South Fork American River – Fresh Pond Ravine
- South Fork American River – Slab Creek Reservoir
- Wallace Canyon

Visual hillslope or visual instream monitoring would be required as part of the effectiveness monitoring. This requirement would be completed through use of the Forest Service Region 5 Best Management Practice Evaluation Program (BMPEP). Only sites in which activities occurred the previous field season would be considered for evaluation. A list of eligible monitoring sites would be created each year, and actual monitoring locations would be selected randomly from the list of eligible sites. Sites that were evaluated and rated as “not implemented” or “not effective” would be revisited the following year to determine if corrective actions have been taken.

An effectiveness monitoring map would be created which displays GPS waypoints of all locations monitored. This map, copies of the BMPEP data sheets, and a brief summary report of the effectiveness monitoring results would be submitted to the Water Board as part of the Annual Report.

Forensic Monitoring

Forensic monitoring would be conducted by a hydrologist, soil scientist, and/or approved soil/hydrologic technician to determine if significant pollution occurred during the winter period as a result of timber harvest activities. This monitoring would be required in watersheds that exceed the TOC. The same watersheds listed above for effectiveness monitoring would also require forensic monitoring.

The Water Board requires forensic monitoring to take place at least two times during the winter period, as follows:

- Once, during or within 12 hours following a 24-hour storm event of at least 2 inches (of rainfall) and after 5 inches (of total precipitation) has accumulated after November 15 and before April 1. Inspections that cannot be conducted during or within 12 hours of such a storm event (due to worker safety, access, or other uncontrollable factors) shall be conducted as soon as possible thereafter.
- Once, during or within 12 hours following a 24-hour storm event of at least 2 inches (of rainfall) and after 15 inches (of total precipitation) has accumulated after November 15 and before April 1. Inspections that cannot be conducted during or within 12 hours of such a storm event (due to worker safety, access, or other uncontrollable factors) shall be conducted as soon as possible thereafter.

In high elevation areas precipitation may be dominated by snow and be inaccessible. In such situations, forensic monitoring would be conducted during spring runoff, as this is the time when erosion is most likely.

Additional Forensic Monitoring shall be conducted if the following "observation trigger" occurs:

- A noticeable significant discharge of sediment is observed in any Class I or Class II watercourse. Photo-point monitoring shall be conducted when such discharge is the result of failed water quality protection management measure(s) or lack of implementation of such measure(s).

Best Management Practices Evaluation Program

Region 5 of the US Forest Service (USFS) has developed a BMPEP for all Forests in the region. The objectives of this program are to: 1) fulfill USFS monitoring commitments to the State Water Resources Control Board (SWRCB), as described in the SWRCB/USFS Management Agency Agreement and *Water Quality Management for National Forest System Lands in California*; 2) assess and document the efficacy of the USFS water quality management program, specifically the implementation and effectiveness of BMPs; and 3) facilitate adaptive management by identifying program shortcomings. In addition, National BMPs have recently been developed, and these require annual monitoring as well.

BMPEPs are assigned to each Forest annually. All sites eligible for evaluation are compiled in a spreadsheet, and then actual evaluation sites are selected randomly. All activities associated with the King Fire Restoration Project would be eligible for evaluation as part of this program. Therefore, additional BMP monitoring, beyond that described above for implementation, effectiveness, and forensic monitoring, is anticipated within this project area.

Stream Condition Inventory Monitoring

The Forest Service Region 5 Water Quality Management Handbook (WQMH) includes requirements for project-level monitoring in watersheds that are at or above thresholds of concern, as determined during the cumulative watershed effects analysis. This includes both hillslope and in-channel monitoring.

Hillslope monitoring requirements would be met by the effectiveness monitoring described in this plan. In-channel monitoring would be completed following the Stream Condition Inventory (SCI) protocol. The WQMH specifies that SCI surveys would be made at the nearest suitable reach downstream of the project area.

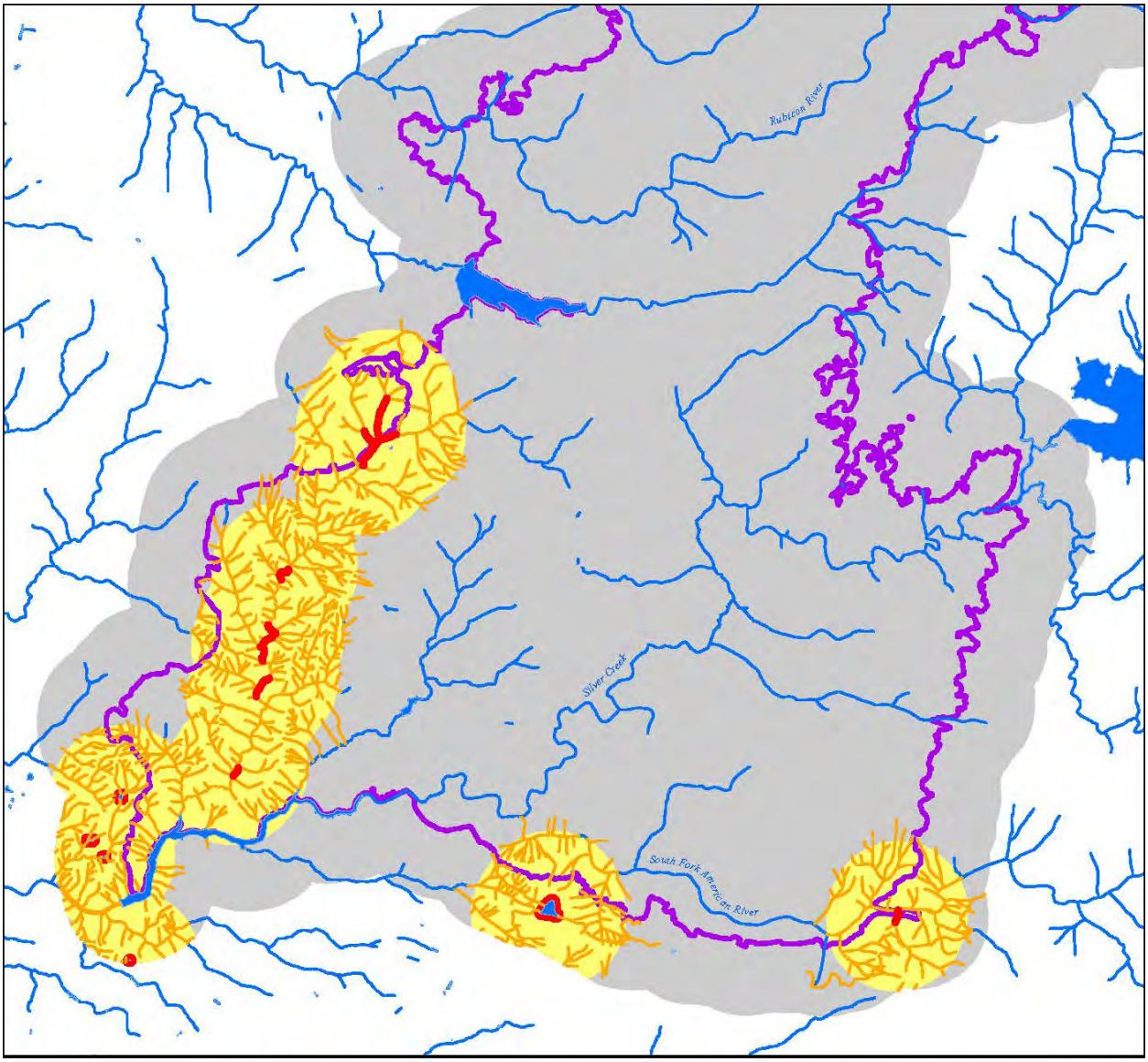
SCI survey reaches would be established before any ground-disturbing activities occur. SCI reaches would be resurveyed following project implementation. SCI survey results would be compared to BMPEP results to evaluate relations between BMP effectiveness and stream-channel responses.

Water Quality Best Management Practices Implementation Checklist

The Forest Service Region 5 WQMH includes requirements for BMP implementation monitoring of all projects with the potential to adversely affect water quality using a "checklist" approach. BMP implementation checklists would document whether and when the site-specific BMPs specified in the NEPA analyses were implemented. The checklists would be the primary systematic means for early detection of potential water quality problems, and would be completed early enough to allow corrective actions to be taken, if needed, prior to any significant rainfall or snowmelt throughout the duration of the project. Depending on the BMP, checklists may be completed prior to ground-disturbing activities, prior to winter periods, and/or at the completion of the project.

Forest Service project staff (Hydrologist, Soil Scientist, Timber Sale Administrators, Engineers, Technicians, etc.) would complete the checklists. A Soil Scientist or Hydrologist would coordinate and review the checklists to ensure that any deficiencies are corrected effectively. All checklists that are part of timber sales would be kept on the Forest as part of the project record and submitted in the Annual Report to the Water Board to meet the requirements of the timber harvest waiver.

Appendix L – Aquatic Wildlife Maps



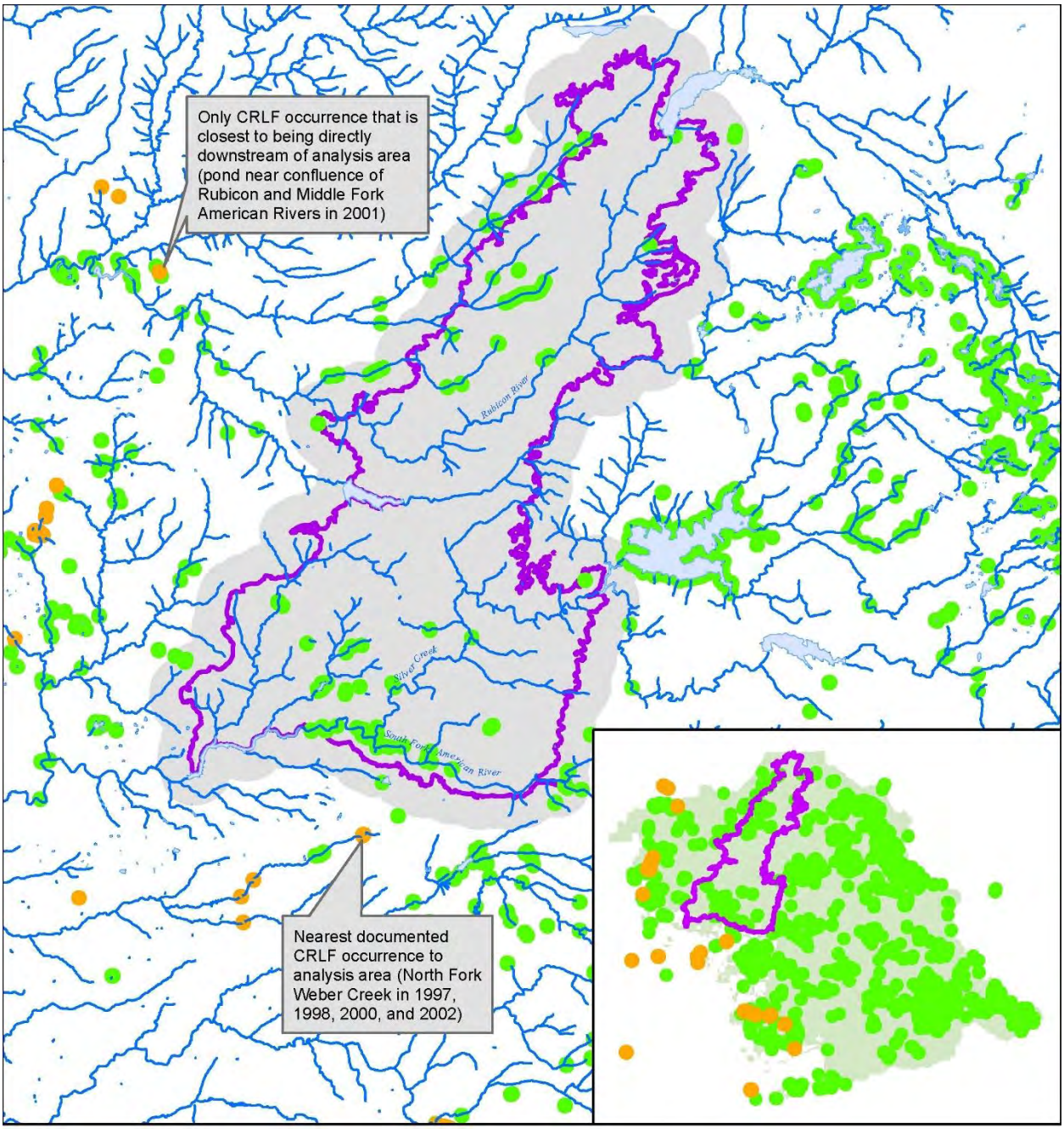
California Red-legged Frog Suitable Habitat

Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District

- Potential CRLF Aquatic Habitat
- Potential CRLF Breeding Habitat
- Potential CRLF Upland Habitat
- Project Area
- CRLF Analyis Area

N

0 1.5 3
Miles

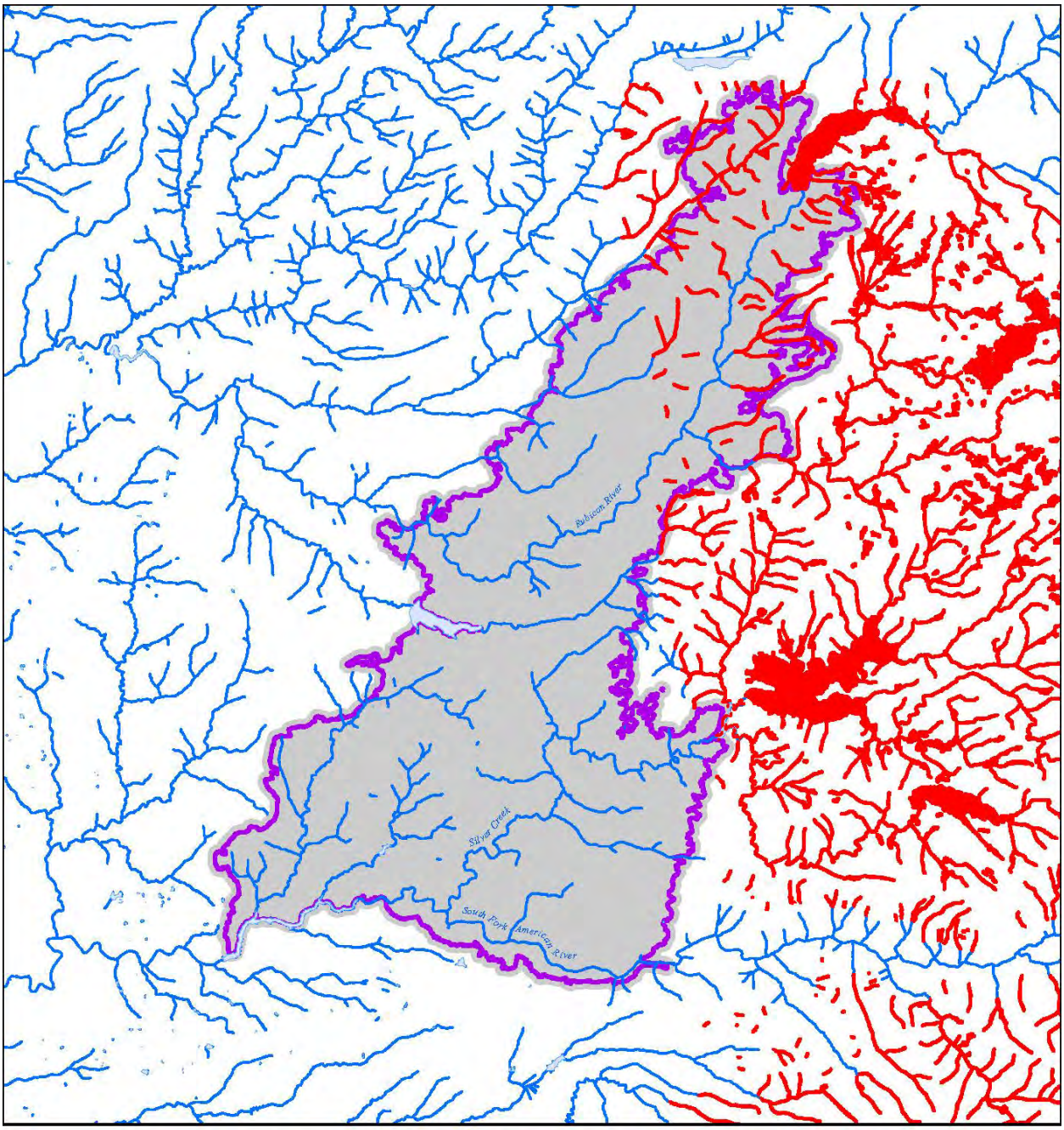


California Red-legged Frog Occurrences

Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District

CRLF occurrences
ENF amphibian/reptile records
Project Area
CRLF Analyis Area

0 3 6
Miles

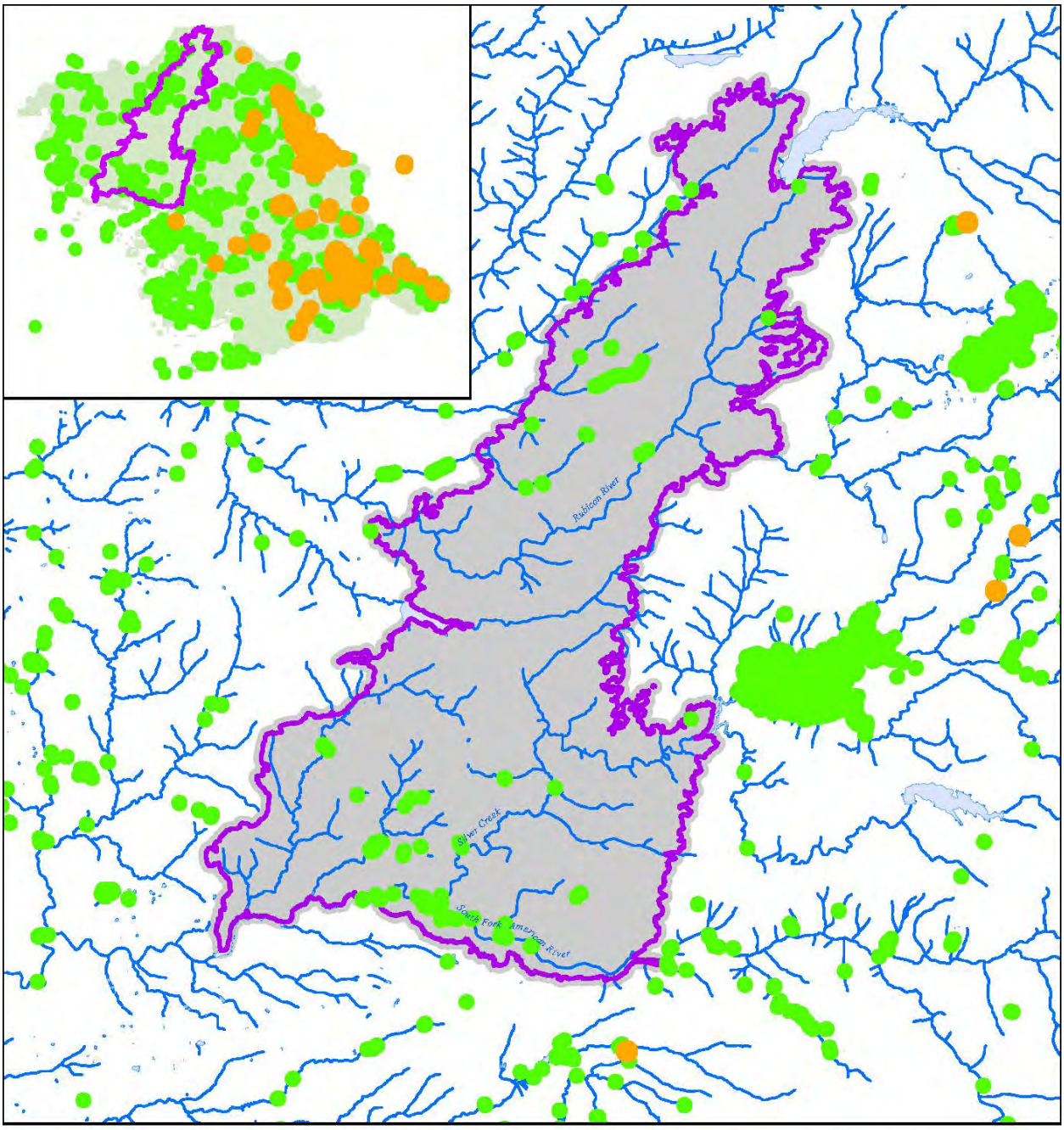


SNYLF Suitable Habitat

Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District

SNYLF Suitable Habitat
Project Area
SNYLF Analysis Area

0 2.5 5
Miles



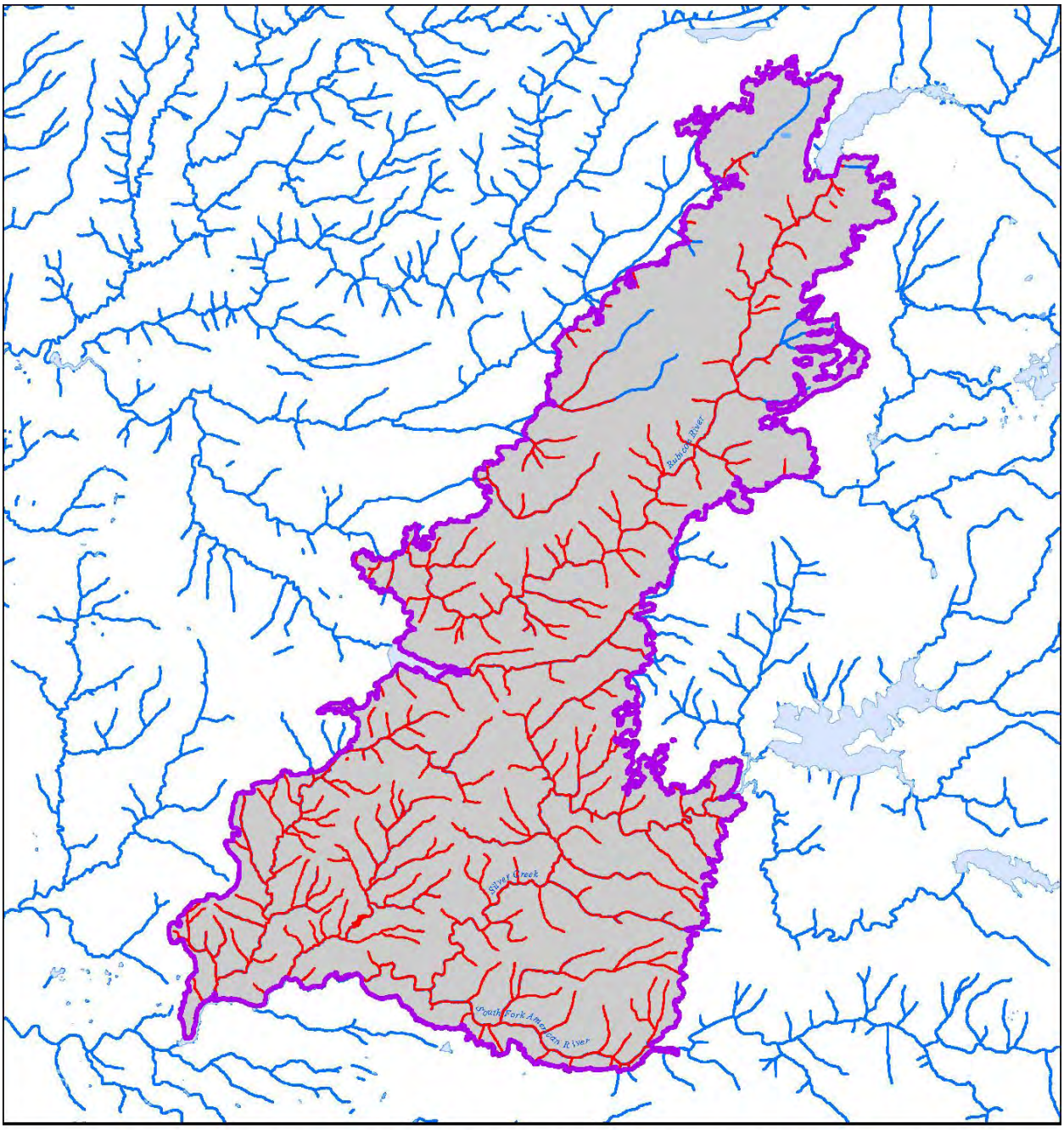
Sierra Nevada Yellow-legged Frog Occurrences

Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District

SNYLF occurrences
ENF amphibian/reptile records
Project Area
SNYLF Analysis Area

N

0 2.5 5
Miles

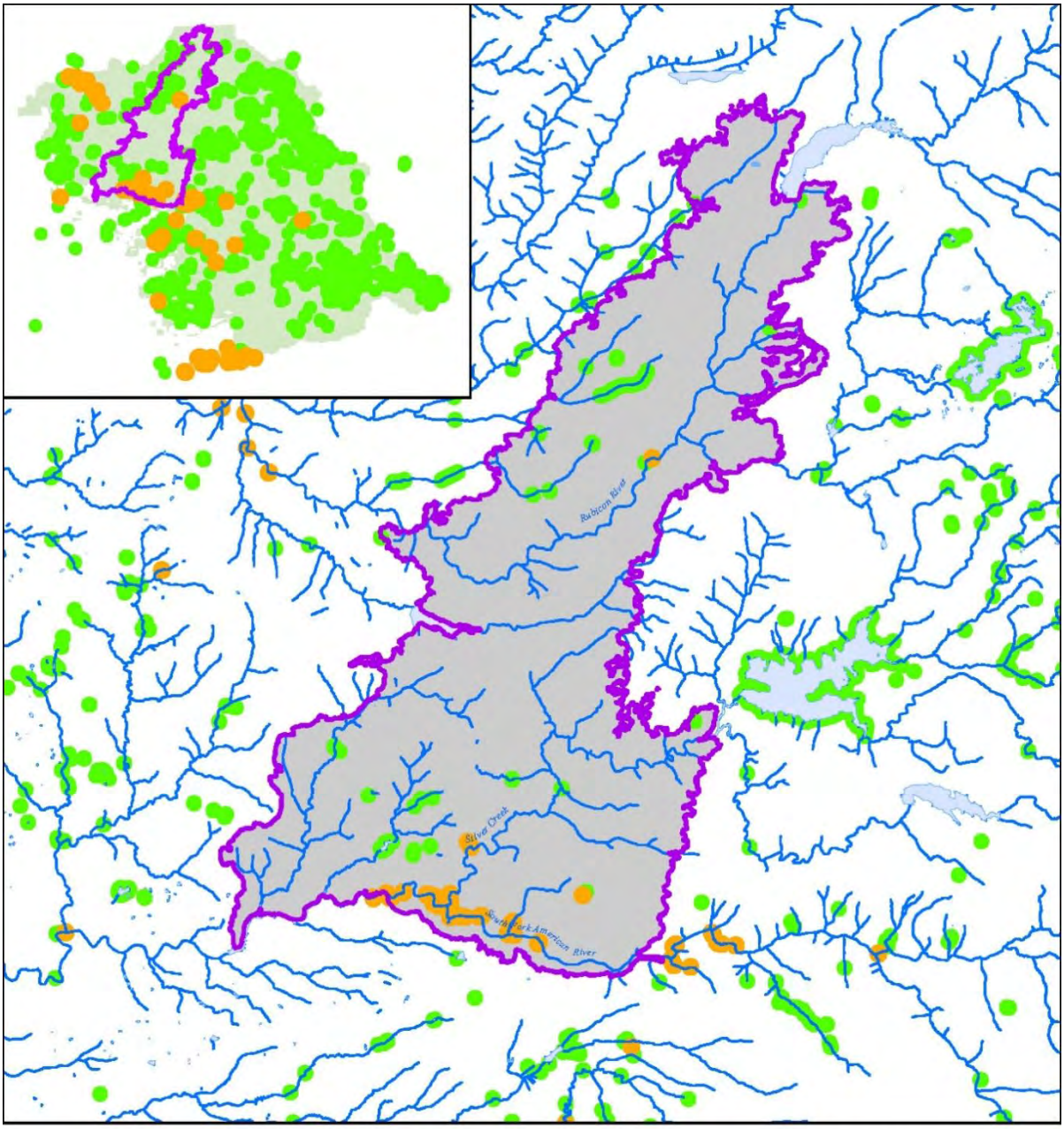


Suitable Foothill Yellow-legged Habitat

Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District

FYLF Habitat
Project Area
FYLF Analysis Area

0 2.25 4.5
Miles

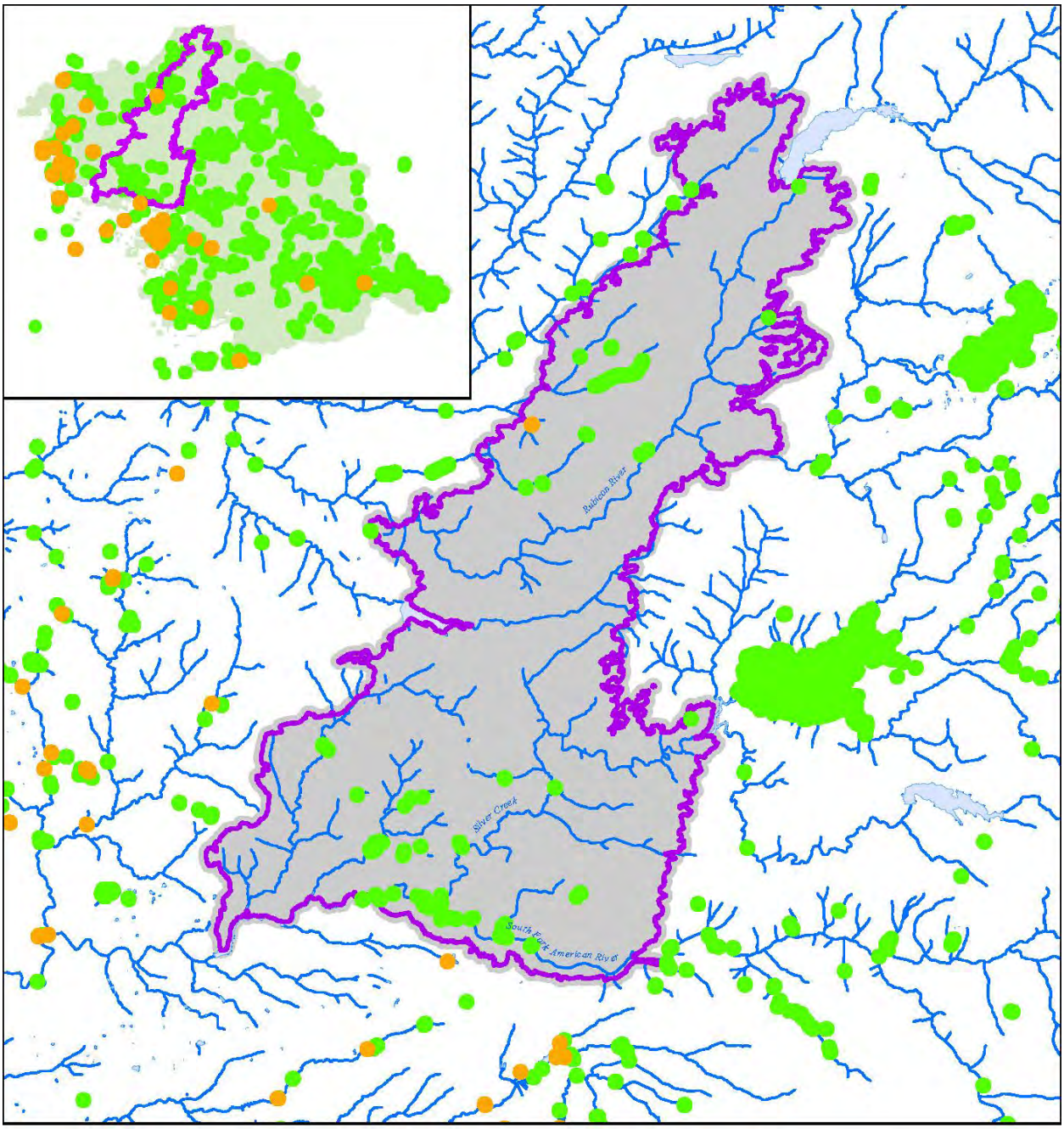


Foothill Yellow-legged Frog Occurrences

Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District

FYLF occurrence
ENF amphibian/reptile records
Project Area
FYLF Analysis Area

0 2.5 5
Miles

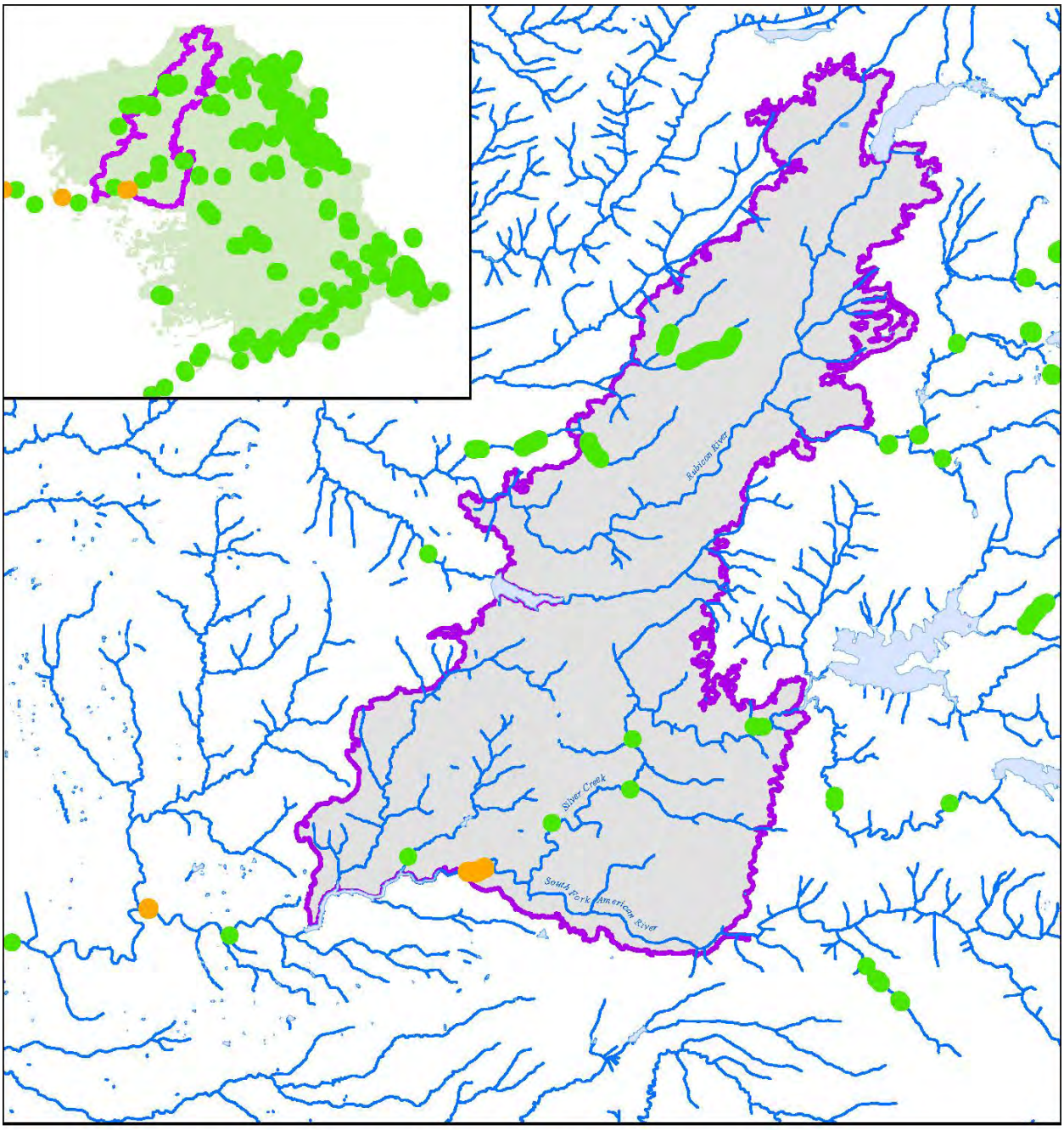


Western Pond Turtle Occurrences

Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District

WPT occurrences
ENF amphibian/reptile records
Project Area
WPT Analysis Area

0 2.5 5
Miles



Hardhead Occurrences

Eldorado National Forest
Georgetown Ranger District
Pacific Ranger District
Placerville Ranger District

Hardhead occurrences
ENF fish surveys
Project and Analysis Area

0 2.5 5
Miles

APPENDIX M: King Fire CWHR Reclassification Crosswalk

Current, post-fire forest vegetation was reclassified using a post-fire vegetation conversion guideline. Forest conifer vegetation types that experienced 25-75% in basal area mortality were adjusted in density of vegetation. Conifer areas that exhibited higher than 75% basal area mortality were re-typed as montane chaparral (MCP) with a size class of "1" (1-6" dbh) and a density of "null." Below is the King Fire CWHR reclassification crosswalk[1]:

CWHR Veg Type	Gridcode	% BA Mortality	Post-fire Typing Convention
Sierran Mixed Conifer (SMC) Douglas-Fir (DFR) White Fir (WFR) Red Fir (RFR) Ponderosa Pine (PPN) Jeffrey Pine (JPN) Closed-Cone Pine-Cypress (CPC) Eastside Pine (EPN)	1-3	0-25	No change
	4	25-50	No change in type or size, but density D or M to P, P to S, and S stays S
	5	50-75	No change in type or size class, but density D or M or P to S, and S stays S
	6	75-90	Change type to MCP, but size to 1 and density to "null"
	7	> 90	Change type to MCP, but size to 1 and density to "null"
Montane Hardwood-Conifer (MHC)	1-3	0-25	No change
	4	25-50	No change in type or size, but density D to M, M to P, P to S, and S stays S
	5	50-75	No change in type or size, but density D or M to S, P or S to S
	6	75-90	No change in type, but size to 1 and density D or M or P to S
	7	> 90	No change in type, but size to 1 and density D or M or P to S
Perennial Grassland (PGS) Cropland (CRC) Vineyard (VIN) Mixed Chaparral (MCH) Montane Chaparral (MCP) Wet Meadow (WTM) Pasture (PAS) Annual Grassland (AGS) Barren (BAR) Urban (URB) Water (WAT)	1-7	0-100	No Change
Blue Oak Woodland (BOW) Blue Oak-Foothill Pine (BOP) Montane Riparian (MRI) Montane Hardwood (MHW) Coastal Oak Woodland (COW)	1-3	0-25	No change
	4	25-50	No change in type or size, but density D or M to P, P to S, and S stays S
	5	50-75	No change in type or size, but density D or M to S, P or S stays S
	6	75-90	No change in type, but size to 1 and density D or M or P to S
	7	> 90	No change in type, but size to 1 and density D or M or P to S

[1] Assumptions in this table are based on the professional expertise of Pacific Southwest Region Silviculturist Joe Sherlock.

Response to Comments

The Environmental Protection Agency published a Notice of Availability (NOA) for the DEIS in the Federal Register on May 22, 2015. The 30-day comment period ended on June 22, 2015. In response to the Forest's request for comments, interested parties submitted 30 total letters from organizations and individuals. For tracking purposes, the interdisciplinary team assigned a respondent number to each letter as it was received. Forest Service direction requires that a Final EIS respond to substantive comments on the Draft EIS (FSH 1909.15, 25.1). Specific comments are within the scope of the proposed action, have a direct relationship to the proposed action, and must include supporting reasons for the Responsible Official to consider (36 CFR 218.2).

This Appendix contains the summary comment statements, organized by commenter and general topics shown below. Table 1 provides a listing of all commenters and their corresponding commenter number.

1. Air Quality and Climate
2. Aquatic Resources
3. Cultural Resources
4. Design Criteria
5. Ecology and Restoration
6. Fire and Fuels
7. Invasive Species
8. Hazard Tree Removal
9. Herbicides
10. NEPA and NFMA
11. Recreation and Visual Resources
12. Reforestation
13. Research Projects
14. Riparian Conservation Areas
15. Salvage
16. Sensitive Plants
17. Soils
18. Society, Culture and Economy
19. Transportation System
20. Vegetation
21. Watershed
22. Wildlife
23. Support for Alternative
24. Other

Table 1. List of Respondents:

LETTER ID	Type	Timely	Last	First	Organization	Remarks
1	Unique	Yes	Artley	Dick		
2	Unique	Yes	Brink	Steve	California Forestry Association	
3	Unique	Yes	Brissinger	Dean		
4	Unique	Yes	Cantelow	Alice	California Native Plant Society	
5	Unique	Yes	Dykstra	Gary		
6	Unique	Yes	Fecko	Andy	PCWA	
7	Unique	Yes	George	Linda		
8	Unique	Yes	Gherardi	Terry		
9	Unique	Yes	Galliano	Robert	Mason, Bruce & Girard	
10	Unique	Yes	Granat	Amy	CORVA	
11	Unique	Yes	Hanson	Chad	JMP and CBD	Justin Augustine and Monica Bond
12	Unique	Yes	Holst	Erik	TU	
13	Unique	Yes	Hoover	Robert	SPI	

LETTER ID	Type	Timely	Last	First	Organization	Remarks
14	Unique	Yes	Lentz	Bill		
15	Unique	Yes	Martyn	Kathleen	EPA	
16	Unique	Yes	Mitchell	Chuck	El Dorado County RCD	Also Georgetown Divide RCD
17	Unique	Yes	Patton	Bob		
18	Unique	Yes	Schaeffer	Kristin	El Dorado Irrigation District	
19	Unique	Yes	Schambach	Karen	Center for Sierra Nevada Conservation	
20	Unique	Yes	Smith	Kathleen		
21	Unique	Yes	Solvesky	Ben	Sierra Forest Legacy	
22	Unique	Yes	Taylor	Mike		
23	!master SOC form	Yes	Taylor	Sue	Save our County	
24	SOC form	Yes	Pridemore	Jim	SOC form	
25	SOC form	Yes	McAllister	Kevin		
26	SOC form	Yes	Duchamp	Francesca		
27	SOC form	Yes	Everett	Rusty		
28	Unique	Yes	Ringgenberg	Cecil	Placerville Tea Party, Solutions Committee	Handwritten
29	Unique	Yes	Van Dyke	Ellen		
30	Unique	Yes	Veerkamp	Gary	EDC BOD	

CBD Center for Biological Diversity
EPA Environmental Protection Agency
JMP John Muir Project
MB&G Mason, Bruce, & Girard
PTP Placerville Tea Party
PCWA Placer County Water Agency
RCD Resource Conservation District
SOC Save Our County
SFL Sierra Forest Legacy
SPI Sierra Pacific Industries
TU Trout Unlimited
UNK Unknown

Air Quality and Climate

1. **Comment (Commenter 12)**: For the portion of material that will be left to decay over time, it's unclear if the analysis included the formation of methane in that process. Methane is 34 times more potent as Greenhouse Gas than Carbon Dioxide.

Response: The analysis of decay over time does not include the formation of methane. If provided literature showing the rate at which decaying wood is likely to release methane the Forest would be happy to review that information. Information on the formation of methane from decay of wood is limited. The FEIS contains an analysis of emissions and carbon storage for the alternatives analyzed on pages 56 to 68.

2. **Comment (Commenter 15)**: The DEIS notes the role of forests in carbon storage, stating that, "United States forests currently serve as a carbon 'sink', offsetting approximately 15% emissions from burning fossil fuels", (page: 3-4). On December 24, 2014, the Council on Environmental Quality released revised draft guidance, superseding the 2010 guidance and describing how federal departments and agencies should consider the effects of greenhouse gas emissions and climate change in their NEPA reviews. This new draft guidance explains that agencies should consider both the potential effects of a proposed action on climate change, as indicated by its estimated greenhouse gas emissions, and the implications of climate change for the environmental effects of a proposed action. We recommend the FEIS be updated to reflect the new CEQ draft guidance.

   EPA suggests that the FEIS include a more systematic and comprehensive discussion of the impacts of climate change on the project, and measures to improve the project's adaptability to climate change. For example, we recommend adding a discussion of the increased vulnerability of specific species under a reasonably anticipated climate change scenario, and an explanation of the projected shift of forest species to more suitable range elevations. We recommend that the FEIS discuss measures to improve forest adaptation to climate change, such as the selection of certain species for replanting.

   Response: Climate Change models project varying patterns of precipitation and warming within in the larger region, including more or less precipitation and varying degrees of warming. This is, in part, because the area exists between grid squares on several major climate models and the resolution of the models is presently too coarse to be predictive for the region. The central expectation of these models, though, is that winter precipitation in the region will increasingly arrive in the form of rain instead of snow. Earlier snowmelt is also occurring and projected to increase. Both increased rain versus snow and earlier snowmelt have significant implications for watershed health and forest fires.

   The effects of climate change are already manifesting in the region, suggesting the need to identify vulnerabilities and related impacts to public safety, natural systems, water supplies, power generation, and recreation. Since any climate effects are potentially exacerbated or diminished by population trends, the following discussion is provided.

   Climate change within the project areas was covered in the FEIS in Appendix A, pg 10 – 11. Models that have been run to estimate the effects of climate on conifer dominated forests suggest that over the next century there will likely be an increased transition of forest to chaparral. It is also likely that fire frequency and severity will continue to increase and fire suppression efforts continue to lead to forest densification in the rest of the landscape. All of this will result in a higher proportion of early-seral forests on the landscape. This project notes several measures to adapt to this predicted climate change. First, management efforts propose focusing on fostering mid- to late-seral stands as it is recognized that this forest type will be threatened due to changes in climate and increases in fire frequency and severity. Second, planting strategies including the planting of appropriate species will be designed to maintain ecological integrity while balancing future climate projections, economics, long-term management feasibility, and desired conditions (FEIS pg. 15). Third, in Alternative 3,

resilience treatments (salvage harvest and reforestation) were excluded from areas that were identified as unsustainable as future conifer forest based on preliminary bioclimatic modelling (FEIS pg. 23). Finally, to learn from the King fire, a research study will be implemented, "Effects of climate variation on plant community recovery after disturbance" (FEIS pg. 21). This study focuses on determining local adaptations of populations along a precipitation gradient, which could be used by managers to help mitigate the effects of climate change and extreme climate events.

Aquatic Resources

Habitat

3. **Comment (Commenter 12)**: In the Proposed Action no mention was made of the fact that the Rubicon River is a State designated Wild Trout Stream. The EIS needs to articulate the effects of the Proposed Action on the aquatic and riparian resources along the Rubicon River as well as the potential effects to this designation.

Response: The presence of this fishery was given consideration during the salvage planning and development of the design criteria. The Rubicon River is a Fish and Game Commission designated Wild Trout River. The designated wild trout section of the river is 30 miles long extending from Hell Hole Reservoir downstream to the Middle Fork American River at the confluence of Oxbow Reservoir. Effects to this designation have been incorporated in the FEIS.

There are no mechanical treatment units in close proximity to the Rubicon River, and impacts to riparian vegetation and soils from ground-disturbing mechanized equipment would not occur. Prescribed burning is proposed within the Rubicon Canyon, and the potential impacts are discussed on page 241 of the FEIS: "Prescribed burning in the Rubicon Canyon could lead to short-term impacts to soil, but the burning would be patchy and potential damage would be localized. The prescribed burning would break up continuity of dense shrub growth that would minimize reburn potential of a future wildfire. Due to riparian exclusion zones, impacts to the Rubicon River are unlikely." Also note that design criteria AR-20 (Ignition Avoidance Areas) in Table 2.15 of the FEIS stipulates that prescribed fire would not be actively ignited within RCAs.

Species

4. **Comment (Commenter 12)**: It should also be noted that the species account for the western pond turtle is somewhat confusing if not misleading. Specifically, page 3-23 Vol 1 states: *"WPTs are highly associated with permanent water in river and stream channels and other waterbodies (e.g., ponds, reservoirs); however, they will seek out and use upland habitats both within and outside of RCAs to escape peak flow events in winter/early spring as well as dry periods during late summer/early fall."*

Page of Vol 1 3-199 states (ref: the ENF official species account):

WPT are habitat generalists and can occur in and adjacent to a variety of aquatic habitats, both lotic (moving water, streams, and rivers) and lentic (still water, ponds and lakes, marshes, and roadside ditches).

Preferred habitat for the pond turtle consists of calm waters, such as near streambanks, backwater, or pools, with vegetated banks and logs or rocks for basking. In streams, adults prefer pools to shallower areas. Perennial water is preferred, but there is an indication that

the turtle can persist in environments where water is seasonally available by means of a process referred to as aestivation (Holland 1994; Rathbun et al.2002). Turtles frequently move quite a bit, often between 100 to 700 feet per day. However, individual turtles typically stay within a several hundred foot reach. They may utilize upland habitat extending as far as 1,700 feet away from water as stream-dwelling individuals will occasionally move away from flood-prone creeks during the rainy season." And page 3-201 states: *"This buffer is assumed to include a large majority of the upland habitat use, but acknowledges that turtles sometimes move distances greater than 1,000 feet from the water."*

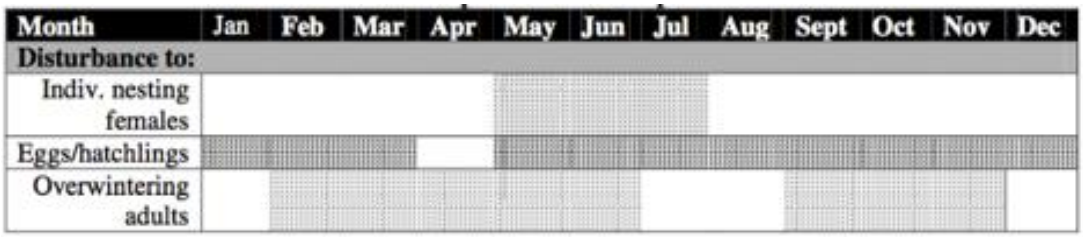
In reviewing the various comments in the DEIS regarding the western pond turtle, the impression one is left with is that they are highly aquatic and that they are infrequent visitors to upland habitats. This is not necessarily true.

Individual western pond turtles (usually males) may have large home ranges and may wander within a given watercourse for several kilometers on a regular basis (Reese 1996). Western pond turtle nests have been found as far as 0.25 mi. from water (Reese and Welsh 1997) in open sunny areas on hillslopes, generally with a south to southwest facing aspect 8. Threats to nests and hatchlings would occur from May through March since the incubation period for western pond turtles is approximately eight months and may remain in the nest for a week or more.

Western pond turtles also move into upland slopes while overwintering. Overwintering movements are poorly understood; however, in Trinity County California, western pond turtles left the study area river in September and began return movements in February, ending in June; the only lull in activity occurred between December and January (Reese and Welsh 1997). In one study in Trinity County, California the average distance of overwintering sites from a watercourse was 550 ft (Ashton and others 1997). In the Sierra Nevada, the most likely time for western pond turtle overwintering movements is during the fall/late fall and early spring and would represent movements to and from upland overwintering sites. If western pond turtles were overwintering within the proposed project area, crushing of individuals could occur during these timeframes.

Based on the above, the potential for western pond turtle disturbance due to project activities is essentially year-round although some months have a higher potential for disturbance than others. This is graphically displayed in the table below.

Table 1. Seasonal movements of western pond turtles and potential for disturbance.



In view of the above discussions, we believe that a more thorough and in-depth discussion of the potential effects to aquatic species needs to occur.

Response: Habitat requirements of western pond turtle are described on page 251 of the FEIS. Direct, indirect, and cumulative effects specific to western pond turtle are analyzed on pages

275 to 278 of the FEIS with appropriate references to the scientific literature. Analysis of effects was based on the analysis assumptions described on pages 252 to 253 of the FEIS:

"*For the WPT, all streams (intermittent, perennial, and ephemeral) and waterbodies below 5,000 feet in elevation provided suitable habitat for the species. This is considered a conservative approach because WPT have preferred habitat features that would not be present in all areas mapped. A 1,000-foot buffer was used for the WPT around suitable aquatic habitats to account for upland habitat use. This buffer is assumed to include a large majority of the upland habitat use, but acknowledges that turtles sometimes move distances greater than 1,000 feet from the water*" (FEIS pg. 252 to 253).

The Forest Service acknowledges that there is uncertainty and conflicting science for some of the management actions. However, impacts to forest resources have been analyzed based on the rationale presented and input from Pacific Southwest Research Station scientists. Numerous scientific publications are cited and utilized in the assessment of effects, showing both positive and negative effects from proposed activities. Design criteria to designed to minimize adverse effects, are addressed in the FEIS in Tables 2.14 and 2.15. Buffering streams and limiting operating periods as proposed can decrease disturbance.

California Red-Legged Frog (CRLF)

5. Comment (Commenter 12): Comments on the aquatic species analysis.

The California red-legged frog (*Rana draytonii*) discussion (DEIS Vol 1, page 3-196) notes *"CRLF surveys specific to the King Fire Restoration Project were not conducted; but this species has not been documented in the project area during previous surveys."* However, there is no indication if California red-legged frog surveys were conducted within the project area and if surveys were conducted, what methods were used (e.g., visual encounter surveys, audio surveys, etc.), how many were done, and when they occurred. The same is true for the Sierra Nevada yellow-legged frog (*Rana sierrae*) discussion (DEIS Vol 1, page 3-198), for the foothill yellow-legged frog (*Rana boylii*)(DEIS Vol 1, page 3-198), and the western pond turtle (*Actinemys marmorata*). For the public and governmental agencies to fully assess the potential direct, indirect, and cumulative effects to the EIS needs to disclose the number, the type, and the extent of prior surveys.

With respect to tree felling within potential California red-legged frog, the DEIS (Vol 1, page 3-212) states "*Tree felling within CRLF habitat could affect individuals; however, design criteria require hand felling away from the aquatic habitat, reducing the risk to CRLF and its aquatic habitat. Individuals in suitable upland habitat would be expected to flee from the site of disturbance.*" There is a similar statement with regard to the Sierra Nevada yellow-legged frog on page 3-216. These statements seemingly indicate that these species have the ability to out-run motorized equipment or falling trees. We believe such statements are misleading and, by inference, underestimate the potential for adverse effects to these species.

Response: Few amphibian or reptile surveys have been conducted within the King Fire perimeter on the Eldorado National Forest (ENF). Primarily, amphibian and reptile observations have been made during aquatic surveys or other forest activity surveys including incidental observations and hydropower relicensing. The following table is included in the Biological Assessment (BA, pg. 5).

Eldorado National Forest Amphibian and Reptile Surveys within the King Fire Perimeter.

Location	Date	Method	Observations and Findings
Bear Creek	June-July 2006	Two Day/Two Night Survey for CRLF	No Findings
Brush Creek	July, 13, 2011/July 2003	Two Day/Two Night Survey for CRLF	No Findings
Pilot Creek	July, 7, 2011	Two Day/Two Night Survey for CRLF	No Findings
Rubicon River	August, 9, 2012	One Day	No Findings
Silver Creek	July, 24, 2013	VES (Visual Encounter Survey)	Only Tree Frogs, No other amphibians.
Gasparni Creek	April, 29, 2010 May, 10, 2010 May, 24, 2010 June, 29, 2010 July, 7, 2010 October, 7, 2010	One Day VES One Day VES One Day VES One Day VES One Day/Two Night Time Surveys for CRLF One Day VES	No Findings No Findings No Findings No Findings No Findings No Findings
Soldier Creek	July, 2003	Two Day/Two Night CRLF Surveys	Two Foothill Yellow-legged Frogs (FYLF)

In 2008, Placer County Water Agency submitted a Special-status Amphibians and Aquatic Reptiles Technical Study Report as part of the Middle Fork American River Project (FERC Project No. 2079) (PCWA 2008). Incidental observations were recorded during surveys for other aquatic species in 2007 (no formal western pond turtle surveys were conducted). A California Native Species Filed Survey form for all species detections was prepared and submitted to the California Natural Diversity Database (CNDDB).

Foothill yellow-legged frog surveys were conducted at 5 locations (three sites within the King Fire perimeter) along the Rubicon River in 2007, by consultants for Placer County Water Agency. Individual frogs of different life stages as well as egg masses were found in the main stem and tributaries of Rubicon River. Abundance was highest in the downstream reaches of the Rubicon River outside of the King Fire perimeter just above Ralston Reservoir.

Based on the results of the CRLF Site Assessment, it was determined that the Rubicon River does not represent habitat for CRLF and are dispersal barriers as defined by USFWS. Large and moderate creeks and small tributaries within the study area are high-gradient, do not support backwater areas, and do not support appropriate vegetation for egg attachment or cover. Therefore, they do not represent potential breeding habitat for CRLF. Diversion pools (North Fork and South Fork Long Canyon Creek diversion pools) within the King Fire perimeter are too shallow, do not retain water through the breeding period, do not support emergent or aquatic vegetation for egg attachment, and have no surrounding riparian vegetation.

On the ENF there were 64 visits recorded in the AqS (Aquatic Surveys) database inside the King Fire perimeter of which 29 are related to amphibians. 7 surveys were specifically related to CRLF and one survey was related to the Sierra Nevada yellow-legged frog. No detections of any threatened, endangered or Forest Service sensitive species were identified.

Based on available information, there have only been a few sightings of FYLF within the Sacramento Municipal Utility District's (SMUD) Upper American River Project and PG&E's Chili Bar Project. Sightings of FYLF's restricted to the King Fire perimeter are limited to the South Fork American River 0.4 miles upstream of Slab Creek Powerhouse. No western pond turtles or California red-legged frogs were observed within the project areas.

DTA (Devine Tarbell & Associates, Inc.) and Stillwater Sciences. 2005. Sacramento Municipal Utility District Upper American River Project and Pacific Gas and Electric Company Chili Bar Project Amphibians and Aquatic Reptiles Technical Report. April 2005, Version 3.

ECORP Consulting. 2011. Surveys for the Foothill Yellow-legged Frog (Rana Boylii) and Western Pond Turtle (Actinemys Marmorata) In Lower Iowa Canyon Creek and South Fork American River.

Placer County Water Agency (PCWA). 2008. FINAL AQ 12 – Special-status Amphibians and Aquatic Reptiles Technical Study Report. PCWA Middle Fork American River Project (FERC Project No. 2079). June 2008.

Cultural Resources

6. **Comment (Commenter 15)**: EPA encourages the Forest Service to ensure that meaningful consultation with all potentially affected tribal governments occurs throughout the NEPA process. The project area is culturally and spiritually important to tribes and tribal consultation is an important component of the decision-making process associated with this project. We recommend that the results of consultations with tribal governments and with the Tribal Historic Preservation Office/State Historic Preservation Office be included in the FEIS.

   Response: Thank you for your comment. Your recommendation has been incorporated into the FEIS (pgs. 86 to 101).

Design Criteria

7. **Comment (Commenter 20)**: Chap 2, p. 2-7. Snag Retention: states that only the portion outside the 150 foot riparian un-salvaged area will be counted as part of the 10% snag retention unit. Why? Given that there will be a 150 foot wide un-salvaged stream buffer, why is there a need to have an adjacent un-salvaged patch up to an additional 5 acres? Given the sensitive nature of the riparian zone, wouldn't it be better to protect it from further potential fire by removing the snags adjacent to the stream buffer, because they contribute to high-severity fire? (I'm talking about high-severity fire, not high-severity tree mortality.)

   Response: Management direction states that "snags should be clumped and distributed irregularly across treatment units" (SNFPA ROD, pg. 52). Refer to Appendix G of the FEIS for a description of the general principles for snag retention.

   Only the portion outside the un-salvaged riparian area would be counted as part of the 10% snag retention unit because the purpose of the snag retention guidelines is to support terrestrial wildlife by maintaining a distribution of snags throughout the treatment area. There is a need to have un-salvaged patches in addition to the un-salvaged riparian areas to promote landscape heterogeneity and minimize effects to species that depend on natural early seral conditions across the project area. Generally, retention patches would be located more than 150 feet from other un-salvaged fire-killed trees such as trees in the riparian buffer zones. The snag retention adjacent to riparian zones is addressed in the Fire and Fuels analysis in Chapter 3 of the FEIS.

Snag retention outside of riparian areas would utilize a clumping pattern to retain snags which will promote decreased surface fuel loadings outside of these zones (FEIS pg. 154).

8. **Comment (Commenter 13)**: *"Design Criteria TW-10 provides protection for historic spotted owl nest trees by incorporating these trees into snag retention patches identified by wildlife crews"* (DEIS pg. 3-250). TW-11 is the correct criteria for "Snag Dependent Wildlife." TW-10 refers to winter range for deer (DEIS pg. 2-28).

   Response: This has been corrected in the Final EIS.

9. **Comment (Commenter 13)**: The DEIS calls for snags to be clumped and distributed irregularly across treatments units (DEIS Appendix G). Please consider the following request:

   - No placement of snags or snag clumps within 500ft slope distance of private property lines (both industrial and residential). This will help provide adequate fire safe clearing along shared property lines for future fire suppression and control as well as adequate safety to private citizens from falling trees.

   Response: The Responsible Official will consider this input when making his decision.

Ecology and Restoration

10. **Comment (Commenter 20)**: Chap 2, p. 2-1 point 1: excludes high-severity patches less than 10 acres and high-severity patches of 150 acres were also maintained commensurate with the NRV. Because the DEIS states that 83% of the high-severity patches were greater than 150 acres, I assume that the less than 10 acre and 150 acres patches comprise 17% of the high severity burn. Why are these being excluded from any treatment or reforestation, especially if they are on ground with less than the 35% slope?

    Response: The Natural Range of Variability (NRV) of high fire-severity patches documented in the scientific literature for Sierra Nevada ponderosa pine and mixed conifer forests was strongly dominated by small patches less than 10 acres in size (Sudworth 1900, Show and Kotok 1924, Kilgore 1973, Skinner 1995, Weatherspoon and Skinner 1995, Skinner and Chang 1996, Minnich et al. 2000, Bradstock et al. 2010, Collins and Stephens 2010). Some portion of the landscape would have also been comprised of large patches but these would have rarely exceeded 150 acres in size (Minnich et al. 2000, Collins and Stephens 2010). The action alternatives proposed in the King Fire Restoration Project break up the continuity of the high severity patches in the King fire. The number of patches would increase across the fire in all alternatives as the treatments effectively break up the large patches into smaller patches and maintain a variable distribution of patches.

    The high fire severity patches that were less than 10 acres in size were excluded from analysis for vegetation treatments other than those associated with hazard tree removal or for removal of dead trees in strategic fire management zones to maintain their current state to benefit a number of early successional species. Additionally, a number of areas that were 10 – 150 acres in size were not treated other than those associated with hazard trees or strategic fire management zones to maintain a number of larger patches critical to species that rely on a large expanse of early seral conditions.

    Reforestation treatments focused on areas that were greater than 10 acres and where a seed source was unlikely to result in a conifer forest and a conifer forest was identified as the desired condition in the King Fire Reforestation and Resilience Strategy (FEIS Appendix B).

11. **Comment (Commenter 20)**: Chap 2, p. 2-6 & 2-7. Prescribed Fire: states that 2,841 acres of prescribed fire would be used on the south slope of the Rubicon Canyon in 5 to 7 years. Given

that USFS personnel have stated that it could take several centuries for the Rubicon to regenerate naturally, what further fuel reduction treatments will be needed in that area? Without any reforestation activity will these prescribed fires become a never ending cycle of brush growth followed by prescribed fire?

Response: The Rubicon Canyon was not identified as a priority for reforestation activities in the King Fire Reforestation and Resilience Strategy (FEIS Appendix B) because of the difficulty in protecting seedlings planted in this area, areas of heavy brush and oak prior to the fire, and the risk for conversion of forest types in that canyon shown in evaluated climate change modeling.

Prescribed fire would be used to restore a more historic fire return interval of 5-15 (McKelevy, 1996) while also creating greater heterogeneity. Burn objectives would include the text from the Prescribed Fire section, "desired condition is a mosaic pattern with 40-60 percent of the acres treated." No other fuel reduction treatments in the prescribed burn unit are called for in the FEIS.

It is expected that prescribed burning will be the most appropriate and feasible treatment in this area of the project. In addition to the resprouting of oaks, over time it is expected that natural regeneration will occur in this canyon. Prescribed burning, while threatening some of this regeneration, is not expected to eliminate regeneration occurring in the canyon in the future and would provide for a reduce fuel condition.

Fire and Fuels

12. **Comment (Commenter 20)**: Chap 2, p. 2-2 point 2: excludes area from reforestation to be maintained as non-conifer grasslands, assuming frequent natural or prescribed fire. Frequent prescribed fire may be an optimistic assumption given weather, personnel and air quality constraints.

    Response: The Responsible Official will consider this recommendation when making his decision. The commenter is incorrect in the assertion that these areas are planned to be maintained as non-conifer grasslands. Point 2 indicates that the Weislander historical data was used to "inform where hardwood/chaparral/grasslands areas may have been replaced by conifers as a result of fire exclusion. These areas were excluded from reforestation as it was assumed they would continue to persist as non-conifer dominated into the future with frequent natural or prescribed fire, such as the south-facing slopes along the South Fork of the American River." Many of these areas are expected to be shrub dominated into the future. With absence of fire it is assumed that in the long term these stands would again trend toward conifer dominated, but in a frequent fire system, as historically existed in this area, and is projected to persist into the future, these areas are expected to be maintained as non-conifer openings.

13. **Comment (Commenter 20)**: Chap 2, p. 2-5 Table 2.1 Areas Identified for Treatment in the Proposed Action: states that there is a total of 2,841 acres in the Rubicon that will be treated by prescribed fire. The same concern as for the above bullet point, isn't this overly optimistic given all the constraints when dealing with prescribed fire? Additionally, as the Rubicon will become a brush field full of snags, what are the containment plans so the fire doesn't spread into other than planned areas?

    Response: The Prescribed Fire paragraph on page 14 of the FEIS states "desired condition is a mosaic pattern with 40-60 percent of the acres treated." Treatment of the landscape in prescribed fire is generally considered to be the attempt to treat or burn. Constraints when dealing with prescribed fire along with fire spread outside of the planned area would be addressed in the Burn Plan. Fire Management Strategy within The King Fire (Appendix C of

the FEIS) identified key fire management treatment zones that would be used in the event of a future wildfire and which would facilitate prescribed fire implementation.

The King Fire highlighted the effectiveness of fuels treatments that aimed to reduce the spread and intensity of fire. During the course of the fire, fire mangers utilized multiple fuel treatment areas in their effort to contain the fire. Poho ridge which included the Hey Joe Fuels Reduction Project and Purple Haze Mastication project were utilized as areas to build fire line with planned burnout operations. Ultimately, portions of the Quintette and Treeage Fuels Reduction Projects assisted to facilitate line construction and successful burnout operations.

14. **Comment (Commenter 20)**: Chap 2, p. 2-5 Table 2.1 Areas Identified for Treatment in the Proposed Action: To continue the discussion about prescribed fire in the Rubicon, would it not make more sense to use prescribed fire in other areas (Gerle Creek or Pacific District) where it would do more good to help seedlings in reforested areas become more established? Prescribed fire in the Rubicon Canyon, done as spot fires, will only create newer brush fields in older brush and snag fields. It also creates a risk of high-severity fire that firefighters will refuse to fight because of the excessive danger, as recently happened in the Biscuit Fire, a re-burn of the 1987 Silver Fire, southern Oregon.

    Response: The commenter suggests it would make more sense to use prescribed fire in other areas, that prescribed fire would create newer brush fields in older brush and snag fields, and prescribed fire creates a risk of high severity fires.

    The Forest Service agrees that burning in old brush fields would most likely create areas of younger brush. The Rubicon prescribed fire will break the continuity of shrub regrowth in areas where other forest management activities are not feasible. This will create heterogeneous mix of fuel types within the canyon. Further prescribed fire use in other areas would be analyzed in future NEPA analysis.

    Prescribed fire in the Rubicon would be conducted during periods of decreased fire danger and as always with firefighter safety as the number one objective.

15. **Comment (Commenter 20)**: Chap 2, p. 2-5 WUI Defense Zones, Strategic Fire Management Zones and Conifer Forest Resiliency Areas: states that mortality monitoring will be done for up to four years. Is that through the fire season of 2019, since this will not begin until end of fire season 2015? Will dead trees be removed each year? (They should be, in order to reduce the fire danger they pose.)

    Response: Removal of dead trees after initial salvage and fuel treatments will be determined based on fuels loading, economic feasibility, and resource impacts. Future mortality that threatens safety may be felled and left in place if removal is not feasible.

16. **Comment (Commenter 17)**: Regarding the Alternative 2 Fuels Analysis and No Action Alternative. It was stated that no treatment would occur on slopes that are over 35%. The No Action Alternative states that there would be a future fuel loading between 40-200 tons to the acre. That would exceed the natural range of variability immensely. Alternative two prescribe "spatially located area treatments (SPLATS)" on slopes under 35% and would have fuel loading of 6-10 tons per acre. I believe this action is attempting to follow guidelines out the Sierra Nevada Framework (Sierra Nevada Forest Plan Amendment). What I am concerned about is that there will be fuels loadings of 40-200 tons per acres untreated between the SPLATS, and 40-200 tons per acre left untreated on slopes above 35%. There was no mention about how long it would take for the residual dead and down to decay in a Mediterranean climate. That issue was addressed in the Star Fire EIS Fuels Analysis for the preferred Alternative. I think it could take over 100 years or more to decay. Is that what we want to leave on the landscape?

Response: As described on page 11 of the FEIS: "Prioritization was given to treating slopes less than 35 percent to reduce costs. Steeper slopes were proposed for treatment where implementation could be accomplished cost effectively or was necessary to meet other objectives of the project". Expected fuel loading in non-treatment areas is described in the analysis of Alternative 1 in the fire and fuels analysis in Chapter 3 of the FEIS. The effects on future fire management based on the arrangement of non-treatment areas coupled with treatments are further analyzed for each alternative in this section of the FEIS.

17. **Comment (Commenter 2)**: CFA could not find any analysis of the amount of broadcast burning and pile burning that would be necessary to complete the objectives for each alternative. Further, CFA could not find whether or not there were sufficient burn days (from historic data) to reasonably complete the work within a short period of time.

Response: For mechanical treatments, estimates of material to be piled and burned are in the range of one landing pile for 20 acres of salvage and five piles per acre for machine piles. For hand treatments 20 piles per acre is estimated. A crew of 10 lighters can burn 50 landing piles per day and 50 acres of machine or hand piles. On average there are 20-30 suitable burn days a year with more available if burn parameters are adjusted for site specific conditions.

Alt	Mech	Piles	Days	Hand*	Piles*	Days*
2	10303ac	250	5	1255	25100	26
3	7377ac	184	4	1252	25040	26
4	14395ac	360	8	1589	31780	32
5	10030ac	250	5	1687	33740	34

*Much uncertainty exists about the exact volumes of material to be burned. This estimate assumes all acres contain treatable material.

18. **Comment (Commenter 9)**: The King Fire Alternative 2 treatment map indicates that a large portion of the Rubicon river drainage in portions of Township 13 North, Range 13 East sections 6, 22, 23, 14, 13, 12 are proposed for a burn only treatment, which will occur in 5 to 7 years. We currently manage an approximately 180 acre parcel in the SW ¼ of section 13 which is surrounded by the burn only treatment. We are planning to reforest the above mentioned parcel within 2 years. We are concerned that the burn only treatment has the potential to escape into newly established conifer plantations on land we manage, which will be particularly susceptible to fire related damage and mortality at the time of the proposed action. We suggest that the salvage treatment be expanded to surround the above mentioned parcel where operationally feasible to a distance of at least ¼ mile out from our property line in order to provide a buffer from the proposed burning activities.

Response: The prescribed fire area in the Rubicon includes T13N, R13E, Sec 12, 13, 14, 22, 23, 24, 26, 27 and T13N, R14E, Section 7 and 18. The private parcel in the SW corner of T13N, R13E, Section 13 does fall within the prescribed fire unit. During the planning phase of the burn, exclusion of fire from the private parcel will be a high priority. Salvage treatments were not considered in area due to steep slopes and access considerations.

19. **Comment (Commenter 9)**: The King Fire Alternative 2 treatment map indicates several areas with no treatment proposed that are adjacent to land managed by MB&G. This condition occurs on portions of Township 13 North Range 13 East sections 20, 15, 10; Township 14 North Range 13 East sections 34, 26, 34; and Township 14 North Range 14 East sections 4, 8, 9, 18, 20, 30. We are concerned that lack of management in areas adjacent to our ownership

will result in an increased fuel hazard and put the reforestation investments made by us at risk.

Response: The areas of no treatment in T13N, R13E, Sec 20, 15 and most of 10 are locations of Protected Activity Centers (PACs). This removes it from consideration for most types of treatment. The remaining area in Sec 10 is over 35% slope and excluded from consideration for treatment.

The areas of no treatment in T13N, R13E, Sec 34 and 26 are also the locations of a PAC.

T14N, R14E, Sec 4, 8, 9, 18, 20, and 30 are in whole or part of PACs. Parts of section 4, 8 and 18 did not meet the high severity burn requirement to be considered for treatment. Portions of sections 8, 9 and 30 are too steep to be considered for treatment.

20. **Comment (Commenter 9)**: The salvage guidelines found on listed on DEIS page 2-5 will result in levels of dead tree removal which will be inadequate to meet the purpose and need 1 & 2 stated on page 1-4. Page 2-5 states that for WUI Defense Zones, Strategic Fire Management Zones and Conifer Forest Resiliency Areas: "trees to be removed have all brown needles or no needles remaining as viewed from the ground". Following fire it is common for many of the trees which initially had green tops to die in subsequent years due to insect activity following fire and wind throw resulting from weekend root structures. It is possible that delayed mortality may be more severe than typical due to extended drought conditions that are currently present in the fire area. We suggest that dying trees also be harvested in the above mentioned zones using the guidelines outlined in *"Marking Guidelines for Fire-Injured Trees in California* (Smith and Cluck 2011)".

Response: The proposed action and project alternatives were designed to balance active management with the retention of important attributes of post fire habitat. The conservative approach to remove dead trees with no green needles (as visible from the ground) is designed to maximize the preservation of live trees in the burned landscape by substantially reducing the risk of cutting a tree that would not have succumbed to its injuries. Salvage treatments have been focused on areas with greater than 90% basal area mortality and strategic areas. Because the majority of the fire area proposed for treatment (greater than 80%) occurs in areas with greater than 90% basal area mortality it was identified by the Forest Service that using marking guidelines that would remove additional mortality is not needed to meet the purpose and need over the majority of the project area.

In mixed severity burn areas within the WUI and SFMZ it is anticipated salvage harvest operations could continue for up to 4 years to capture additional mortality where it is feasible to do so, primarily along roads (FEIS Chapter 2). Actual timing may vary based on deterioration of material, resource impacts, weather and resource availability (personnel and budget). Trees which fade and die within other salvage sale units may be removed as part of contracts open if management requirements are met. Along roads and other areas where hazard trees are identified as needing to be treated, a 70% probability of mortality is used outside of Protected Activity Centers.

21. **Comment (Commenter 30)**: We understand direct and indirect affects that some might be worried about in alternative four. However, over the last twenty years we have watched our forests become over grown. This overgrowth has created a huge life threatening liability for El Dorado County residents, tourists, and the animals that live in the forest. If we do not do something now, the tragedy of the King Fire will only replay itself out again

Response: The Forest Service agrees. As described in the FEIS, pgs. xii, 4 and , the purposes of this project includes the removal of dead trees in strategic fire management areas to improve

the agency's ability to manage and control future fires (Purpose and Need #2) and actively manage severely burned areas to facilitate restoration and resilience (Purpose and Need #3).

22. **Comment (Commenter 2)**: Outside of the Scope of this EIS -- The Proposed Action Map delineates Wildland Urban Interface (WUI). The King Fire (and the Rim Fire) has demonstrated that the experienced fire behavior makes the 1.5 mile distance for the WUI boundary to no longer be appropriate. CFA believes the federal land management agencies should revisit the definition of WUI. The distance part of the definition should be the experienced distance of rate of spread within one 24 hour burn period. Based on this definition, most of the King Fire would be within the WUI. The WUI boundary should be updated at least for the entire Sierra Nevada Mountains based on the experienced 16 mile one day run of the King Fire. Similar distances in one 24 hour burn period were experienced in 2008 in northern California.

    Response: The Forest Service used the WUI definition and data as set forth by the 2004 Sierra Nevada Forest Plan Amendment.

23. **Comment (Commenter 2)**: **Alternative 2, (p. xv)** -- The Draft EIS should be explicit that you'll consider all the options for treating biomass within the King Fire perimeter including removal. With 3 more years of the Biomass Crop Assistance (BCAP) matching payment program (up to $20/bone dry ton on a 1:1 match) available, much if not all of the King Fire perimeter is within reach of the Rocklin, Woodland and Ione biomass powerplants. Therefore the statement "Piles would be burned by hand techniques" should be expanded to include the option of removal.

    Response: The removal of biomass material removed to landings to cogeneration facilities is included in the proposed project: "Log landings and decking areas would generally employ one or more of the following: log loaders, chainsaws, tree processors, chippers, log trucks, fuel trucks, and chip vans" (FEIS, pg. 13) and is analyzed in the FEIS.

    The removal of fuels piles scattered through the woods would result in increased effects from those analyzed to multiple resources including watershed, soils, vegetation, and wildlife which are not currently analyzed with this project. This project does not preclude additional NEPA analysis to remove the piles within the treatment units if future interest in biomass from the area results in a real opportunity for removal, and that removal is assessed to be beneficial to the management of this area.

24. **Comment (Commenter 2)**: Unfortunately brush competition in the high severity burn areas will become a reality in the next 1-2 years and will quickly move the landscape in the following years to a fire threat condition again. With this in mind, CFA hopes you will give serious consideration to proposing to restore moderate and high severity areas adjacent to private property (rather than just the Wildland Urban Interface) to a forested condition. As you know, private landowners that were impacted by the King Fire are already making large investments to restore their properties and they hope the Forest Service will do the same.

    Response: The Responsible Official will consider your input.

25. **Comment (Commenter 2)**: Reducing fuel loading along private property boundaries and providing dead tree removal and fuel treatment within 100' of all National Forest System open roads (Levels 2, 3, 4 and 5) should be included in the eventual selected alternative. About 90% of wildfires are human caused.

    Response: The Responsible Official will consider your input.

26. **Comment (Commenter 6)**: Fire Fuels, pages 3-107 through 3-108 Vegetation, pages 3-157 through 3-163 Watersheds, pages 3-187 thought 3-190. Thirty six percent of the Middle Fork

American River watershed, which provides public water supply, hydroelectric power generation, multidimensional recreational opportunity and environmental values to the people of Placer County and the region, has burned since the year 2000.

The trend toward larger and more severe fires in the watershed compromises the health of the watershed and reliability of beneficial uses of watershed resources such as habitat, quality of the water supply, operational integrity of water and hydroelectric power generation infrastructure, safe access, and recreation. This trend toward larger and more severe fires in the watershed must be interrupted by proactive management of fuel loads.

PCWA strongly supports and encourages implementation of activities such as those described in the above-referenced sections of the DEIS which will facilitate the restoration of the canyons of the Rubicon River and its tributaries to stable, enduring, fire-resilient, hydrologic health. These activities include:

1. Removing dead trees in strategic fire management areas to improve the ability to manage and control future fires,
2. Actively managing severely burnt areas to facilitate forest restoration and resilience, and,
3. Promoting long-term soil and hydrologic recovery of burned areas.

Response: The Forest Service appreciates the support from PCWA for the implementation of activities to help restore the Rubicon Canyon and its tributaries, and feel the proposed actions will make the area more fire-resilient and improve soil and hydrologic conditions.

27. Comment (Commenter 12): Similar to roads, activities related to timber harvest, fuels treatments, burn pile location can have negative effects on post-fire recovery of hydrologic, aquatic and riparian resources. Therefore, in order for the public to adequately assess the effects of the various alternatives, we ask that the following be articulated within perennial and intermittent stream channel RCAs and potential habitats for listed, sensitive, and management indicator species.

- Method and duration of harvest activities.
- Present and expected post-harvest canopy cover within one site-potential tree height of the Channels.
- Specific type of fuel treatments.
- Present and expected post-harvest coarse woody debris levels/frequency

Response: Timber harvest activities are proposed within RCAs outside of mechanical equipment exclusion zones in areas of high and moderate burn severity, and methods are presented in Chapter 2 of the FEIS. Operating requirements for ground-based mechanized equipment in RCAs are presented in Table 2.14 and 2.15 in the FEIS. The Forest Service feels these operating requirements, as well as design criteria presented in Table 2.14 and 2.15 and BMPs presented in Appendix F will adequately protect riparian and aquatic resources. In many areas, proposed treatments will improve riparian and aquatic resources by increasing groundcover and obliterating past disturbances that are sources of erosion.

It is not feasible to characterize pre-harvest course woody debris levels/frequency in all perennial and intermittent stream channels within the project area, however many RCAs had most if not all large wood consumed both within the stream channel and the adjacent RCA (see page 228 in the FEIS). Post-harvest large wood retention design criteria are presented in AR-12 within Table 2.15. A limited amount of ground disturbance is proposed in some watershed sensitive areas (WSAs) within the mechanical exclusion zones.

The pre and post-harvest canopy cover within the area of effects requested by the commenter do not provide additional, useful information to the Forest Service for this decision. No canopy cover requirements exist for the proposed activities in this project. A major reduction in canopy cover within the proposed treatment areas have been a result of the fire. The effects to canopy cover are described in the Vegetation section in Chapter 3 of the FEIS on pages 196 to 199 in terms of CWHR classifications, basal area mortality, and trees per acre and effects to riparian areas from the fire are described in the Watershed section in Chapter 3 of the FEIS on pages 225 to 228. Because salvage is only proposed for trees that have no green needles, as visible from the ground, or trees that are hazardous to public and woodworker safety, very little change in canopy cover is expected from the proposed activities. Reforestation activities, where occurring in proximity to streams, would increase stream cover and future contribution of large down logs.

Post fire canopy cover is highly variable across the landscape due to variability in burn intensity. Except for some roadside fuels treatment units and select WSAs, tree removal would not occur in near-stream mechanical exclusion zones and therefore near-stream canopy cover would not be affected. As discussed on page 240 of the FEIS, there is a tradeoff with removing dead trees with respect to impacting stream temperature. Reduction in canopy cover in RCA units outside of mechanical exclusion zones would increase the amount of sunlight reaching the stream channel to some degree, although changes to water temperature would likely not be measurable as standing dead trees with little to no leaves or pine needles don't provide much shade. At the same time, increased sunlight in the riparian zone would stimulate growth of riparian vegetation that would provide more long-term stream shade compared to standing dead trees.

Hazard Tree Removal

28. Comment (Commenter 19): In order to ensure an objective TAR (Travel Analysis Report) evaluation of roads in the fire-affected watersheds, we urge that hazard tree and salvage logging be limited to ML-3, -4, and -5 roads, until the TAR has been completed and approved. The TAR is due at the end of September, so it is highly unlikely any implementation of the King Fire restoration project would begin before then anyway. It makes no sense to spend money on hazard tree removal for roads that would be better candidates for decommissioning. The expenditure of scarce resources would be best reserved for those roads determined by the TAR to be "likely needed." Premature hazard tree removal would bias the TAR in favor of keeping roads on which restoration dollars had already been expended. Once the TAR is adopted, hazard tree removal should occur only along roads identified a "likely needed," unless there was a clear and immediate danger to workers or the public from individual trees on other roads.

Response: Road maintenance level 2 is defined in the FSH 7709.58, chapter 10, section 12.3 as: Assigned to roads open for use by high-clearance vehicles. An alternative was developed which removed only hazard trees on Maintenance Level 3, 4, and 5 roads (pg. 39 of the FEIS). One of the purposes of the project is to reduce the risk from falling dead, dying, and damaged trees that pose a significant safety concern to forest visitors and workers (FEIS, pg. xii and 1). This alternative did not meet the purpose and need to reduce the risk from falling dead, dying, and damaged trees to workers and forest visitors as hazard trees would remain in on approximately 162 miles of maintenance Level 2 roads open to the public.

The Travel Management System is being reviewed in accordance with subpart A; this analysis will be documented in the TAR. A decision identifying roads on the forest open to use by the public was completed in 2008. The 2008 ENF Public Wheeled Motorized Vehicle Management

Decision allows highway legal and non-highway legal motor vehicle use by the public on 1,002 miles of Maintenance Level-2 native surfaced roads.

29. **Comment (Commenter 2)**: Table S1 shows roadside hazard tree removal on Level 2 roads in all 4 action alternatives. However the description of Alternative 2, 3, 4, and 5 does not consistently display this information in the text on page xv.

Response: The description of Alternatives Considered in Detail in the Summary section of the DEIS displays the differences between the Alternatives. As hazard tree removal is the same between alternatives this information is not summarized for each alternative in that location, however it is included in the table as described in the comment.

30. **Comment (Commenter 2)**: Unfortunately brush competition in the high severity burn areas will become a reality in the next 1-2 years and will quickly move the landscape in the following years to a fire threat condition again. With this in mind, CFA hopes you will give serious consideration to proposing to restore moderate and high severity areas adjacent to private property (rather than just the Wildland Urban Interface) to a forested condition. As you know, private landowners that were impacted by the King Fire are already making large investments to restore their properties and they hope the Forest Service will do the same.

Response: The Responsible Official will consider your input.

31. **Comment (Commenter 2)**: Expectation that essentially all acres planned for reforestation will need one or more herbicide treatments. Particularly in the White Meadows Road area, south-facing slopes, that experienced high severity burn, are already a "carpet" of bear clover; completely occupying the forest floor. CFA believes it is highly unlikely that a treatment of a 5' circle around each seedling, where bear clover already completely occupies the forest floor, will be effective.

Response: A 5 foot radius only treatment is proposed as part of Alternative 5 in the FEIS. Alternatives 2 and 4 include treatment of brush between the 5 foot radius where all competing vegetation is proposed to be targeted around trees.

As described in MacDonald and Fiddler (2010):

> *"Because roots of competing plant species rapidly extend into cleared areas and capture valuable site resources, the treated area must be large enough (preferably a 5-ft radius) for the conifer seedling to establish its root system unencumbered for at least the first year and usually for the first 3 years. Early treatment of competing vegetation is extremely important and the most cost effective."*

As described in Chapter 3 of the FEIS (pg. 217 and 218), with only radial release shrub levels are likely to be similar to hand treatment only and still likely to result in higher competition and mortality than with more extensive herbicide application within the units. It should be noted that limited reforestation is proposed in the WUI area around White Meadows due to the mixed intensity burn, south slope location and component of oak within the area.

32. **Comment (Commenter 5)**: Dykstra here,
Does this include personal property
Of hazardous trees? My property
Has not been logged yet and my
Has been built !!!!!

Response: Portions of the comment were missing in the submitted comment; however it appears a question about whether hazard tree removal would include removal on private property. Hazard trees would be felled and left in place on roads used for the project that cross private property. It is not within the scope of this project to fall hazard trees that are on private property that are not a hazard to project activities. If there are trees on National Forest system lands that are a hazard to private structures these should be identified with the District and will be addressed.

33. **Comment (Commenter 9)**: Additionally, many of the roads used to access our land do not have treatment proposed adjacent to them, which will lead to the use of the roads in the coming years becoming difficult and dangerous as trees begin to fall in the roadway. We suggest that all areas adjacent to land managed by MB&G and roadways which access said land be treated where operationally feasible, with the preferred treatment method being salvage.

    Response: The Responsible Official will consider this recommendation when making a decision.

Herbicides

34. **Comment (Commenter 22)**: The use of a radial spray application will help achieve these goals [minimize infestation of invasive plants] by minimizing the amount of herbicide applied during the planting process which will be applied only to a 5 foot radius around a planted tree. This, along with the unplanted space between tree groupings, will minimize impacts to the native plant community as help reduce the potential establishment of invasive plant species within the planted areas by maintaining natural areas composed of native plant species in-between group of planted conifers.

    Response: The Responsible Official will consider your input.

35. **Comment (Commenter 4)**: We believe limiting herbicide application and/or hand grubbing to within a 5 foot radius of planted trees is very important. Keeping the area between tree clusters in a native state will minimize the potential invasion of invasive species in these planted areas, which in recent times have often become areas infested by exotic-invasive plant species.

    CNPS is concerned though that the specific and cumulative impacts of herbicide use to native seed banks and to biological diversity in reforestation efforts of burned forests have not been well quantified. Preliminary studies in the Plumas National Forest, presented by one of their forest ecologists at a recent statewide CNPS meeting, did show that native shrubs can actually help improve reforestation success in some situations. We hope that the Eldorado National Forest will follow up on recent studies of other forests, and will encourage similar studies on the Eldorado.

    Response: As described on page 19 of the FEIS, a research project proposed by Eric Knapp, Malcolm North, Morris Johnson, and Martin Ritchie within the King Fire would examine the question: "Do salvage operations affect overall understory biodiversity and does logging disturbance facilitate invasion by non-native species?" as part of their study.

    A large body of literature summarized in MacDonald and Fiddler 2010 (2010) indicates that presence of shrubs and other competing vegetation, especially during seedling establishment has a negative effect on seedling growth and survival, however observations of improved survival during specific years has been noted to be positively correlated with shrubs, especially for oaks (Bohlman and Safford, 2015).

    Based on the literature it is not clear that herbicide use would decrease the presence of native plants as described in the comment, though limited shrub removal in areas identified with non-

native invasive plants is likely to maintain a lower abundance of those plants. As discussed in the DEIS, with the proposed herbicide application:

"Over the short term, plant abundance may be affected by herbicide treatments, but no plant species would be expected to be eliminated from release treatments. Sites with reduced shrubs may have increased plant diversity and species richness compared to stands that are left untreated or only radially released. Battles et al. (2001) found that at the Blodgett Research Station in Georgetown, California, understory species richness was significantly greater in managed plantations than in less intensive treatment types. In mixed forests in Canada, Sutton (1993) found no detectable effect on species composition 10 years after herbicide treatments. DiTomaso et al. (1997) in northern California found no long-term detrimental effect on vegetative cover or species evenness with herbicide use. They also found that, in areas without herbicide treatment, biodiversity and, to a lesser extent, species evenness had not recovered after 14 years, in contrast with herbicide treated areas. Mcginnis et al. (2010) included both the Cleveland and Star Fires on the Eldorado National Forest in their study plots and found that grass and forb cover increased in plots that had been treated with herbicide, but where alien plants were present, their cover was significantly increased over areas where herbicide was not applied." (FEIS pg. 208 to 209)

36. **Comment (Commenter 2)**: Is there evidence that a 5' circle around each seedling has been found to be effective when bear clover fully occupies the site?

Response: As described in MacDonald and Fiddler (2010):

"Because roots of competing plant species rapidly extend into cleared areas and capture valuable site resources, the treated area must be large enough (preferably a 5-ft radius) for the conifer seedling to establish its root system unencumbered for at least the first year and usually for the first 3 years. Early treatment of competing vegetation is extremely important and the most cost effective."

As discussed in Chapter 3 of the FEIS (pg. 217 to 218), with only radial release shrub levels are likely to be similar to hand treatment only and still likely to result in higher competition and mortality than with more extensive herbicide application within the units.

37. **Comment (Commenter 12)**: Additionally, to protect riparian and aquatic resources, herbicide treatments within perennial and intermittent SNFPA RCAs need to be limited to treatments for designated "noxious weeds."
Relative to pesticide/herbicide application, Appendix I, the Riparian Conservation Objective analysis mistakenly states "No new pesticide use within RCAs is proposed for this project. Limited pesticide use for targeted invasive species treatment would continue under the previous project decision Forest-wide Treatment of Invasive Species Project (ENF 2013), which includes project design criteria to protect RCAs and associated plant and animal species." In reality there will be pesticide treatments in the SNFPA RCAs; however, treatments will be limited by the Design Criteria stated in Table 2.15.Pesticide applications in RCAs should be clearly stated.

Response: Design Criteria AR-9 has been clarified for the Final EIS. No herbicide application within CRLF buffers, within RCAs of perennial and intermittent streams, or within 25 feet of ephemeral streams is proposed under this project. Noxious weed treatment is not proposed in this Decision. Targeted invasive plant treatments are covered under the Forest-Wide Treatment of Invasive Plant Environmental Assessment (ENF 2013) and would be reviewed and approved in accordance with that decision.

38. **Comment (Commenter 15)**: The proposed project calls for both manual and herbicide release to decrease shrub concentration around newly planted trees (page: 2-11). We recommend that the Forest Service include a commitment in the Final EIS to adhere to pesticide label directions if

the selected alternative includes pesticide (including herbicide) use. We also recommend that the FEIS specify appropriate buffer zones to protect water quality from any pesticide applications, and describe how pesticide mixing and storage areas would be sited and managed to further protect water sources and other sensitive areas, such as food source and/or herb gathering areas. Lastly, we recommend that the FEIS clearly identify which herbicide or other pesticide products, if any, would be approved for use and in which areas.

Response: The Forest Service follows label direction, applicable laws, and BMPs identified in Appendix F of the FEIS. Buffer distances for herbicide application to near water are identified as AR-9 on page 29 of the FEIS and buffer distances for herbicide application near sensitive plant sites are identified as BR-8 on page 33 of the FEIS. Consultation with tribal governments did not identify any gathering areas within the project area. As specified on page 18 of the FEIS, Glyphosate (Rodeo or equivalent brand) is the proposed herbicide. Specific units with herbicide release proposed were identified in Appendix D of the FEIS.

NEPA and NFMA

Alternatives

39. Comment (Commenter 20): **Alternative 3 -** This alternative does not do enough to reduce the fuel load in the burn footprint, and thus, does not do enough to reduce the danger of future wildfire in the El Dorado National Forest. It does very little to improve the fire resilience of the forest, nor to restore the burned areas. While this alternative argues that complex early seral forest is the rarest form of forest development, it is probably no rarer than in the pre-European forest, where much lower density forests would have resulted in smaller fires, or large fires that resulted in a much smaller proportion of high severity burn of large trees, thus creating only a small portion of complex early seral forest.

Response: The Responsible Official will consider your input when making a decision.

40. Comment (Commenter 20): **Alternative 5 -** This alternative coupled with acreages and treatments from Alternative 4 would be acceptable. As long as the necessary release was done for both survival and growth for the same number of seedlings as prescribed in Alternative 4, I have no problem with the release being done by manual rather than herbicidal treatment.

Response: The responsible official will consider your input

41. Comment (Commenter 12): To ensure the conservation, protection, and restoration of trout populations we request that an alternative be developed that focuses on more reasonable protections for riparian and aquatic resources. We understand that that such an alternative needs to be economically viable and submit that an alternative that does nothing else but eliminate herbicide application for conifer release in perennial and intermittent Riparian Conservation Areas (RCAs) and eliminates skidding within 150 feet of perennial and intermittent channels would be consistent with these goals.

Response: The Forest Service feel that the protection measures developed for this project make project activities consistent with Riparian Conservation Objectives (RCOs), as discussed in the RCO Consistency Report (Appendix I in the FEIS). The operating requirements for ground-based mechanized equipment in RCAs (Table 2.14), as well as the design criteria presented in Table 2.15 and BMPs presented in Appendix F, will adequately protect riparian and aquatic resources, and a new alternative with a larger exclusion zone is not justified. In many cases, proposed activities within RCAs will improve riparian and aquatic conditions. For example, soil cover was consumed throughout many RCAs as described on page 228 to 229 of the FEIS and substantial erosion has been observed in some areas. Post-logging groundcover

requirements would increase groundcover, reduce erosion in these areas and lead to improvements in riparian and aquatic resources.

The Forest Service has not proposed herbicide release of conifers within RCAs for intermittent and perennial streams in any alternative (see AR-9 on page 29 of the FEIS).

42. **Comment (Commenter 15)**: EPA has rated all action alternatives in the DEIS as Lack of Objections (LO; see enclosed "Summary of Rating Definitions"). We support the best management practices and resource protection measures included in the project design.

    The DEIS provides a good summary of compliance with the smoke management plans; assumptions related to, and measures to reduce, the impacts of prescribed bums; and the Forest's coordination with other federal and state stakeholders.

    Response: Thank you for your comment.

Cumulative Effects

43. **Comment (Commenter 19)**: **Travel Analysis Subpart A** - For nearly 30 years, CSNC's primary focus has been on the impacts of motorized roads and trails on public land resources. Those impacts are well documented in the literature; sediment from native surface forest roads is considered to be the greatest contributor of sediment to National Forest rivers and streams. After the King Fire, ENF specialists - and you - acknowledged that forest roads in watersheds burned in that fire posed the greatest challenges to soil stabilization and restoration efforts. So we are surprised to see no mention of the Subpart A project in the King Fire DEIS cumulative impacts assessment.

    Response: Subpart A Travel Analysis is currently being completed at a 'forest scale'. The Forest is taking a broad look at the whole road system and the associated risks and benefits to users and resources across the Forest. The process will identify potential opportunities for changes to the road system. Inputs to the process include ecological, social, cultural and economic information. Subpart A findings will inform NEPA analysis in the future.

    The Sub part A Travel Analysis is separate from NEPA and does not result in a decision with a selected alternative to be implemented. The end product will be a report that displays the findings as opportunities and provides recommendations. These recommendations will inform future management decisions for, and administration of, the National Forest Transportation System.

    A decision identifying roads on the forest open to use by the public was completed in 2008.

Purpose and Need

44. **Comment (Commenter 12)**: Forests are key to clean water. About 80 percent of the Nation's scarce freshwater resources originate on forests, which cover about one-third of the Nation's land area. The forested land absorbs rain, refills underground aquifers, cools and cleanses water, slows storm runoff, reduces flooding, sustains watershed stability and resilience, and provides critical habitat for fish and wildlife. In addition to providing habitat for listed and management indicator species, as well as recreational activities such as fishing, camping, and boating, the watersheds affected by the King Fire include hydroelectric and domestic water facilities operated by the Sacramento Municipal Utility District, the El Dorado Irrigation District, and the Placer County Water Agency.

    Insofar as one of the implied objectives of the King Fire Restoration Project Environmental Impact Statement (DEIS) is to lay the foundation for fire resiliency and limit the risk of future large, high intensity fires, we believe that the EIS should consider a broad array of values—

including watersheds, aquatic and terrestrial wildlife habitat quality and connectivity, ecosystem services, and other social and economic interests.

Because of the values listed above and in view the fact that the action being analyzed is a restoration project, we ask that both the Purpose and Need and the Proposed Action include specific statements related to the recovery of aquatic and riparian resources, present and desired watershed condition class, watershed resiliency, and beneficial uses of water.

In an earlier version of the Purpose and Need (December 19, 2014) included the following item:

> "*6. Reduce existing and potential sources of soil movement and sedimentation to streams, and reduce large woody fuel accumulation in sensitive areas where a future fire is likely to have detrimental effects on soil, water, natural and cultural resources: In areas of moderate and high severity fire, there are opportunities to reduce existing sources of sediment to streams from roads and previous ground disturbance. In addition, timber stands in areas of high fire severity are at risk of accumulating high surface fuel loads as fire killed trees fall to the ground. In a future fire, high surface fuel loads can lead to increased soil temperatures and longer fire residence times, which can negatively impact soil, aquatic resources, and cultural sites. Excessive large woody debris also limits future vegetation and landscape management options*."

However, this verbiage has been removed from the DEIS. In view of the hydroelectric and recreational values associated with the watersheds affected by the King Fire, we believe this verbiage needs to be re-inserted in the final environmental impact statement and considered in the analyses. Furthermore, verbiage related to aquatic and riparian functionality needs to be identified as a significant issue and carried forth in a viable alternative.

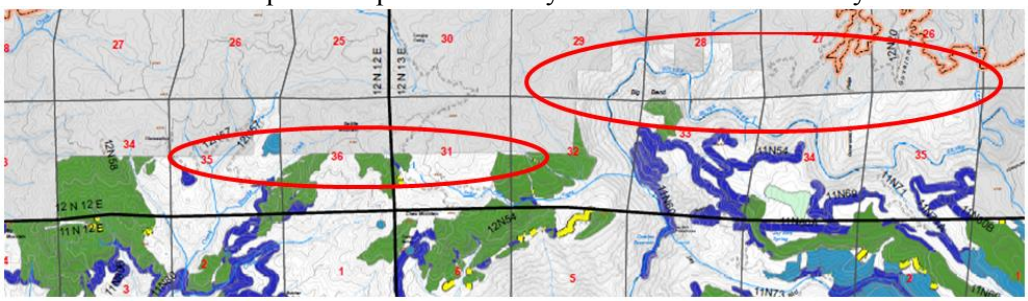
Response: The purpose and need presented in the December 19th, 2014 scoping document were updated based on public and internal comments, to better describe the objectives for doing project activities and the scope of the analysis. The purpose and need reflects the difference between the existing condition of the project site and the desired condition of the project site. In the Purpose and Need presented in the DEIS (updated from the December 19, 2014 version), the elements in Number 6 above were combined with Number 3: Actively manage severely burned areas to facilitate restoration and resilience. Watershed, soil, aquatic, and riparian resources are addressed under multiple subheadings (b, c, d, e, and g) within Purpose and Need Number 3. Activities identified as needed to meet desired conditions within the project area were not changed based on the differing language in the Scoping Notice, however the Forest Service feels that the rationale for those activities was made clearer by the edits to the Purpose and Need for the DEIS and carried forward into the FEIS.

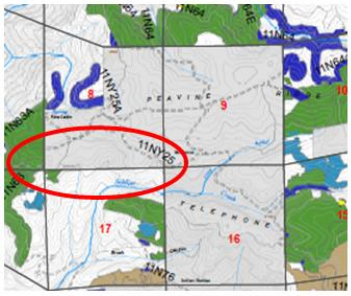
45. Comment (Commenter 13): Purpose and Need item #1: *Reduce the risk from falling dead, dying, and damaged trees that pose a significant safety concern to forest visitors and workers, and create a hazard to private property, infrastructure, and cultural resources.*

We are pleased to see that more consideration was given to this area of the Purpose and Need since Scoping. Sierra Pacific Industries has begun an extensive restoration effort across our 20,000 acres that were lost in the King Fire, with National Forest land bordering us on two sides. It is imperative that the Forest implement treatments along the common boundary with private property (both residential and industrial) in order to meet the Purpose and Need. SPI's long term

investment will be in jeopardy without treatments on the USFS side of the line. We believe Alternative 4 is best suited to accomplish this objective.

Please see attached photos of USFS standing dead timber along shared boundaries with SPI. Alternative 4 still falls a bit short of abating all future fire and safety hazards along shared private property lines. Numerous miles of shared boundary along the "Main Block" and the "McManus" area of SPI's ownership are not planned for any treatment at all under any Alternative.





The DEIS refers to "…*further restoration and rehabilitation activities within in the King Fire*…" after the current document decision is made (DEIS pg. 1-2). Hazard abatement and fuel reduction work along the shared boundary needs to be included follow-up projects.

The overall objective of item #1 is to reduce hazards and safety concerns. Alternative 4 includes 3,671 acres of "Strategic Roadside Buffer Zone" which is in addition to 198 miles of Roadside Hazard (common to all Alternatives). Alternative 4 gives the Forest the best opportunity to meet the goals of the Purpose and Need

Response: The Responsible Official will consider your input when making his decision. The Forest Service has to balance multiple priorities, objectives, uses, and species in its activities as a multiple use agency. At times, certain management objectives are in tension, if not direct conflict, with one another. For example, through this Project, the Forest seeks to reduce fire hazard yet, the Forest Service also recognizes a need to conserve burned forest habitat for wildlife species. Through the development of alternatives within the King Fire Restoration Project, the Forest has tried to strike a reasonable balance between these two goals at the landscape level.

Additional, the Forest Service has, through the development of the proposal identified areas that are reasonable to efficiently and effectively treat to meet the purpose and need of the project for safety and for strategic treatment from a fire management priority. Abating all future fire and safety hazards along shared private property lines would not be feasible and could result in unacceptable resource effects.

46. Comment (Commenter 13): Purpose and Need item #2: *Remove dead trees in strategic fire management areas to improve the agency's ability to manage and control future fires.*

The marking guidelines (DEIS pg. 2-5) chosen will only target trees with brown needles or no needles. Coupled with snag retention limits of 10% (outside of ridge top or roadway corridor) these areas will retain far too many dead trees per acre post-treatment to meet the objectives of the treatment which include:

- Effective suppression and control of future fires
- Provide control lines for the application of future prescribed fires in the project area
- Firefighter safety

Alternatives 2, 4 and 5 contain the highest number of SFMZ acres. Alternative 4 is best suited to achieve effective SFMZ's due to the addition of SPLAT's designed to enhance the function of the SFMZ's (DEIS pg. 2-17). Alternative 3 proposes the least number of acres in SFMZ's and also limiting the size of the SFMZ's compared to the Proposed Action (DEIS pg. 2-15). Alternative 3 is the least equipped to meet the Purpose and Need in this area.

Response: The Responsible Official will consider your input when making his decision.

47. Comment (Commenter 13): Purpose and Need item #3: *Actively manage severely burned areas to facilitate restoration and resilience.*
(DEIS pg. 1-4):

a. reforestation of severely burned areas where forest regeneration would otherwise be significantly delayed or unsuccessful due to the lack of sufficient nearby seed sources;
b. removal of dead trees that would otherwise deteriorate and fall resulting in increased likelihood of high-severity fires that would: 1) jeopardize the survival of trees in the reforested areas, and 2) threaten sensitive areas and damage soil, water, and cultural resources; and,
c. road repair and rehabilitation of existing sources of erosion to aid in protecting water quality, soil productivity, and aquatic habitat.
d. Forest stands in severely burned areas are at risk of delayed or unsuccessful natural reforestation, increased fire hazard, and significant watershed damage. By engaging in reforestation, fuel reduction, and watershed improvement, the agency intends to restore a diverse conifer forest that is resilient over time and contributes to a mosaic of various forest seral stages and habitat types at the landscape scale.
e. In a future fire, high surface fuel loads can lead to increased soil temperatures and longer fire residence times, which can negatively impact reforested areas, soil, aquatic resources, and cultural sites. Reducing the continuity and amount of future fuel loads and engaging in active reforestation will not only move the treated areas to a more resilient condition, but such treatments will also facilitate future forest management using prescribed fire and mechanical treatments to engage in long-term forest restoration.
f. Fuel reduction and reforestation treatments are appropriate in strategic fire management areas as well as other areas where the dominant purpose is restoring a resilient forest (greater fuel reduction and tree removal may be required in the strategic fire management areas to achieve the specific stand characteristics required in such areas).
g. Repairing roads and treatments to mitigate erosion, such as adding groundcover and alleviating compaction, will aid in protecting water quality, soil productivity, and aquatic habitat.

Alternative 4 provides the best opportunity to achieve the goals of restoration and resilience by providing the most treatment acres, highest estimated monetary return (more $= more trees planted & more rehabilitation), the most reforestation/planting acres and the most acres of "Conifer Forest Resiliency Areas."

Alternative	Acres Treated (all methods)	Conifer Forest Resiliency Area (acres)	Strategic Fire Mgmt Zones	Reforestation/ Planting (acres)	% Cost offset by Timber Revenue	Road Repair/Maint (miles)
1	0	0	0	0	0%	0
2	17,200	5,709	8,465	11,561	55%	261
3	13,544	4,547	5,945	8,107	31%	261
4	22,097	6,662	8,455	12,081	71%	261
5	17,200	5,709	8,465	11,561	41%	261

Response: The Responsible Official will consider your input when making his decision.

48. Comment (Commenter 13): Purpose and Need item #4*: Balance active management with the retention of important attributes of post-fire habitat at the landscape scale and within treatment areas to support the diversity and abundance of species.*

Summary: *Complex early-seral forest. Retain a sufficient number and distribution of snags, shrubs, and other plants to provide habitat and other important ecological functions without generating excess future fuels and jeopardizing the survival of planted trees and safety to workers.*

Post-fire salvage logging is necessary to meet the Purpose and Need and although it is a controversial activity in post-fire environments, salvage harvest and replanting can provide a balance between early –seral recovery processes and restoration of old-forest habitat (pg. 195,GTR-PSW-247, 2014). Overall, Alternative 4 is best suited to accomplish balanced management.

Regarding the California Spotted Owls, we believe surveys for owl presence should be conducted in the proposed adjusted activity centers. Salvage work adjacent to adjusted activity centers, but not within, should be allowed if owls are absent. Salvage work will still create suitable foraging habitat as shrubs, forbs, and trees revegetate the salvaged areas. Salvage work in areas where birds are not present should not be restricted with an LOP.

The Forest should also study the presence of owls over time to determine persistence in burned landscapes with both treated areas and untreated areas. The Moonlight Fire in Plumas County had immediate loss of owls and owl habitat, whereas the Rim Fire in Tuolumne County apparently had mixed results on initial owl survival. The fire presents an opportunity to initiate a study on salvage effects.

Response: The Responsible Official will consider your input when making his decision. Owl surveys have been and are being conducted in accordance with Forest Service policy. LOPs are based on nesting owl pairs. Owl surveys are being conducted across the Project area in 2015 and additional surveys are planned for 2016. Salvage work is planned adjacent to some, but not within any activity centers beyond roadside hazard tree removal. The quality and timing of owl foraging habitat development post-salvage is debatable. LOPs will be informed by surveys and lifted where protocol determines a verified unoccupied status territory. The proposed action incorporated elements to protect spotted owls as stated in the FEIS page 10. Where post-fire persistence of a spotted owl territory was expected, salvage harvest within 0.7 mile of the territory center was not proposed except for the purpose of hazard reduction or establishment of strategic fire management zones. Additionally, the ongoing CSO demography study will compare owl survival, reproduction, and occupancy between burned and unburned sites.

49. Comment (Commenter 13): **Purpose and Need item #5***: Expeditiously recover timber killed by the fire commensurate with available markets for the purpose of generating funds to offset the cost of restoration activities and contribute to societal needs for wood products.*

The range of Alternatives specific to this area is provided in the Summary of Environmental Consequences, Table S.2 (FEIS pg. xviii) as well in Table 3E.2 (FEIS pg. 124).

Table 3E.2 Anticipated Revenue and Costs for Alternatives 2, 3, 4, and 5 (rounded to the nearest $1,000)

Alternatives	2	3	4	5
Sawtimber Value	$ 8,412,000	$ 5,926,000	$11,986,000	$ 8,412,000
Road Repair Costs[1]	$ 644,000	$ 644,000	$ 644,000	$ 644,000
Non Marketable Tree Removal to Landings (in conjunction with salvage logging)[2]	$ 2,432,000	$ 1,791,000	$ 3,568,000	$ 2,432,000
Mechanical Biomass	$ 1,518,000	$ 1,328,000	$ 1,642,000	$ 1,518,000
Mastication	$ 809,000	$ 589,000	$ 821,000	$ 809,000
Hand Cutting Hazard Trees & Leave in Place	$ 42,000	$ 36,000	$ 30,000	$ 42,000
Hand Cutting with Piling	$ 1,265,000	$ 939,000	$ 1,192,000	$ 1,265,000
Pile Burning	$ 138,000	$ 73,000	$ 150,000	$ 138,000
Prescribed Burning	$ 142,000	$ 142,000	$ 142,000	$ 142,000
Tree Planting[3]	$ 3,179,000	$ 2,229,000	$ 3,322,000	$ 3,179,000
Hand Release[4]	$ 772,000	$10,944,000	$ 787,000	$ 772,000
Herbicide Release[5]	$ 4,140,000	$ 0	$ 4,344,000	$ 9,314,000
Watershed Sensitive Area Treatments	$ 181,000	$ 181,000	$ 181,000	$ 181,000
Total Costs	**$15,262,000**	**$18,896,000**	**$16,822,000**	**$20,436,000**
Revenue Minus Cost	**- $6,850,000**	**-$12,970,000**	**- $4,836,000**	**-$12,024,000**
Percent of Total Cost Potentially Funded	**55%**	**32%**	**71%**	**41%**

Alternative 4 clearly provides the best options for meeting the Purpose and Need for offsetting restoration costs. Timely removal being a key component to the cost offset equation. Expected deterioration rates are outlined on pages 3-69, 3-70. Both quality and total volume will greatly be affected over time as outlined in Table 3E.1 (DEIS pg. 3-72). The loss of volume 1-2 years post-fire is expected to be 37% (DEIS pg. 3-69). Time is of the essence in meeting the objectives of this Purpose and Need item. Socio-Economics should be included in the Purpose and Need under this particular item. The commerical sale of timber from the various restoration projects (as well as service contracts) that will stem from this EIS will not only help offset costs, but will create and/or help sustain jobs (direct and indirect) in the surrounding forest-dependant communities. Restoration projects such as this one can and should generate monies for rehabilitation work and provide returns to local communities (pg. 187, PSW-GTR-247, 2014).

Limited Operating Periods will greatly impact the Forests' ability to "expedisciuosly" complete restoration activities and should be considered carefully. The Design Criteria on page 2-27 and 2-28 list the specific survey and site protections that will be afforded to terrestrial wildlife within the project area.

TW	LOP	No Ops
CSO	3/1 - 8/15	w/in 1/4 mile
Goshawk	2/15 - 9/15	w/in 1/4 mile
Bald Eagle	1/31 - 8/31	w/in 1/4 mile

The King Fire assessment area contained 46 owl PACs pre-fire and now contains 36 PACs. Numerous PACs for numerous species in the heart of the Normal Operating Season will make expedient implementation impossible in some cases (all Alternatives).

Response: The Responsible Official will consider your input. Limited operating periods are proposed in compliance with the Forest Plan.

50. **Comment (Commenter 13)**: **Purpose and Need item #6**: *Promote scientific research to increase knowledge regarding the effects of large fires on the environment, how to reduce the risk of future fires, and how to restore resilient forests after fires.*

Sierra Pacific Industries supports such research opportunities and has performed such research on our own timberlands as a result of the Ponderosa Fire of 2012. *Post-Wildfire Salvage Logging, Soil Erosion, and Sediment Delivery- Ponderosa Fire, Battle Creek Watershed, Northern California* (James, 2014) details first-year data from a post-wildfire soil erosion study of salvage logging. I have attached a copy of the Executive Summary for reference.

Response: The Responsible Official will consider your input.

Reforestation

51. **Comment (Commenter 20)**: Chap 2, p. 2-9 Table 2.6 Desired Stand Condition and Initial Planting Density by Location: states what the desired density and planting density will be for Strategic Fire Management and WUI Zones, and Conifer Resiliency Zones. Given the current drought conditions and expected climate change conditions, I am concerned that the survival rate indicated by the difference between desired and planting densities is overly optimistic. Historical survival rates may not be correct for the changing environmental conditions as we move forward. Is it more expensive to go back into a previously planted area, assess survival rates and species, and then replant as determined necessary as opposed to planting at a slightly denser rate to begin with and then thing according to need?

Response: Replanting is more expensive than initial planting. The mortality rates are optimistic for initial survival, however, given past experience on the forest, where effective site preparation and release occurs seedling survival is typically high. Mortality rates based on data collected in frequent fire forests are the best current scientific data we have available to base mortality rates for desired conditions. Mortality rates in over dense stands are typically higher.

52. **Comment (Commenter 20)**: Chap 2, p. 2-10 paragraph 5 Planting: states that release at time of planting will be an area 2 to 5 feet around seedlings but on p.2-11 Manual Release Treatments: states that initial manual release will be an area 5 to 8 feet around seedlings. Is this a contradiction?

Response: This has been clarified in the FEIS. The 2-5 foot radius is for scalping at the time of planting. The 5-8 foot manual release treatment is a follow up release that would occur 1-5 years after the planting.

53. **Comment (Commenter 20)**: Chap 2, p. 2-11 Chemical Release Treatments, Follow-up Release Treatments: states that release would be done if shrub cover is in patches larger than 10 acres. This seems an excessively large patch size.

    Response: The Responsible Official will consider your input. The acreage of shrub cover that will require a follow-up release was determined using patch sizes for high severity fire from the NRV data.

54. **Comment (Commenter 3)**: Additionally some properties that neighbor the Forest Service are effectively abandoned or are not able to be commercially restored. Some of these properties [including mine] exist along the ridges and canyons of Spring Valley, namely Grays Canyon. For these properties along the route of the Forest Service cleanup will there be any opt-in services included to restore resilient forests after fires?

    Response: This project only proposes activities on National Forest System lands except where road reconstruction and hazard tree falling would occur in accordance with a road use easement or agreement. Reforestation activities are only proposed to occur on National Forest System lands. Assistance for restoration on private lands may be available through the local Resource Conservation District.

Research Projects

55. **Comment (Commenter 20)**: Chap 2, p. 2-3 point 5, bullet point 3: Asks whether pre-fire PAC status of CSO predicts post-fire colonization by black-backed woodpeckers. Without breaking this down into pre and post-fire condition of each PAC, I fail to see how the answer to this question provides any useful scientific data. I also question the validity of interring a relationship between CSO and black-backed woodpecker habitat without testing to see if there is a relationship between other species habitats, both plant and animal and black-backed woodpeckers. There are just too many variables not being considered in this study.

    Response: This description was erroneously placed on page 2-3 of the DEIS. This was a proposed study from a 3rd party principle investigator. This study stems from the principal investigator's anecdotal observations that a) some of the structural elements that make for good Spotted Owl habitat convert readily to good Black-backed Woodpecker habitat when burned by wildfire, and b) at least at some fires, Black-backed Woodpeckers seem especially likely to occupy post-fire areas that were part of pre-fire Spotted Owl PACs. Testing this hypothesis could be informative for planning and may facilitate multi-species management given the current contentions over: how to manage Spotted Owl PACs that burn, and how to determine which or how much habitat to retain for Black-backed Woodpeckers. Factors such as pre- and post-fire habitat conditions within the PACs would indeed be considered; the commenter has made incorrect assumptions based on a brief summary description of the research. Data analysis and evaluation of the hypothesis about a substantial overlap between pre-fire Spotted Owl habitat and post-fire Black-backed Woodpecker habitat would be conducted by the third-party researchers with separate funding. The FEIS had been updated with the correct information.

56. **Comment (Commenter 20)**: Chap 2, p. 2-12 Research point 1, Effect of salvage and replanting on fuel complex : states that one of the questions to be answered is how long to fire-killed snags

remain upright, but further down is states that the research data will only be collected prior to salvage and in the two summers following salvage. Is this long enough to determine how long snags remain standing?

Response: This has been clarified for the Final EIS. The study would be set up for the long term, with initial funding secured as necessary to carry out the first phase (3 years). Three years would allow for the set-up of the experimental design, collect pre-salvage stand data, and evaluation of the initial response of understory vegetation and the fuel complex. Three years is well before many of the snags are expected to fall and become fuel, and before planted tree seedlings are large enough to influence competing vegetation. With a solid experimental design in place, we will be in a position to leverage the initial investment to fund longer-term data collection. Ultimately, data will likely be collected within the experimental units for decades.

57. Comment (Commenter 12): To provide reference points for future actions as well as adaptive management strategies, research studies should include efforts to evaluate the short- and long-term effects of fire and post-fire activities to aquatic organisms and riparian resources.

Response: Research proposed in this project has been identified by research scientists interested in pursuing topics that are consistent with the other purpose and need elements identified in the King Fire Restoration EIS. No research scientists have thus far approached the Forest with an interest in pursuing this topic on the King Fire. The Eldorado National Forest is not funding research. This decision will not preclude future research to aquatic organism or riparian resources in this area.

Riparian Conservation Areas

58. Comment (Commenter 12): Comments on the alternatives and future actions.
Several statements in the DEIS are somewhat misleading with regard to activities that will or may take place in the various RCAs. As an example, page 3-102 (Vol 1) states "*No planned salvage harvest would occur in RCAs. Snag retention outside of riparian areas would utilize a clumping pattern to retain snags which will promote decreased surface fuel loadings outside of these zones*." This verbiage leaves the reader with the impression that salvage harvest would not occur in RCAs. However, a review of Table 2.14, Operating Requirements for Ground-Based Mechanized Equipment in Riparian Conservation Areas (Vol 1, page 2-20) indicates that salvage could occur in the SNFPA RCAs.

In regard to statements referencing RCAs, Table 2.15 states "*Do not actively ignite prescribed fire within RCAs, or piles within 100 feet of CRLF breeding habitat, or within SNYLF buffers*." indicating that ignition of prescribed fire will not occur within the SNFPA defined RCAs. We question if this is actually the case given the number of ephemeral drainages and the 150 foot SNFPA RCA on each of these drainages.

We appreciate the considerations for riparian and aquatic resources presently included in the DEIS (e.g., Table 2.14 Operating Requirements for Ground-Based Mechanized Equipment in Riparian Conservation Area, Table 2.15 Summary of Design Criteria); however, to protect riparian and aquatic resources, any and all log skidding needs to be eliminated from the operating requirements for ground based mechanized equipment within 150 feet of perennial and intermittent stream channels.

Response: The statement on page 3-102 of the DEIS is an error and has been edited to reflect that salvage is proposed within RCAs, following the operation guidelines presented in Table 2.14. The operating requirements for ground-based mechanized equipment in RCAs (Table 2.14), as well as the design criteria presented in Table 2.15 and BMPs presented in Appendix F, will adequately protect riparian and aquatic resources, and a new alternative with a larger exclusion zone is not justified. With respect to ignition of prescribed fires, per AR-15 on page 2-22 of the DEIS t prescribed fires proposed in this project would not be actively ignited within RCAs.

59. Comment (Commenter 12): In order for the public to fully assess the potential effects to riparian and aquatic resources from the various alternatives, the acreage of the treatments in the various SNFPA RCAs needs to be included in Table 2.20 Comparison of Alternatives.

Response: The effects to watershed resources, including RCAs is found in the FEIS (pgs. 218 to 245). In addition, the Riparian Conservation Objectives Consistency Report can be found within Appendix I of the FEIS.

Salvage

60. Comment (Commenter 2): Consider that one skyline yarder could yard approximately 1,000 acres in one season.

Response: The Responsible Official will consider your input in his decision.

61. Comment (Commenter 13): Salvage Guidelines- All action Alternatives (DEIS pg 2-5):
WUI Defense Zones, Strategic Fire Management Zones, and Conifer Forest Resiliency Areas:
"…Trees to be removed have all brown needles or no needles remaining as viewed from the ground. Mortality monitoring for removal of dead trees may be conducted up to four years following the fire."

Our comment during scoping urged the agency to push for guidelines set forth in Report # RO-11-01 *Marking Guidelines for Fire-Injured Trees in California* (Smith and Cluck, 2011) to avoid imminent mortality resulting in large fuel loading and a compromised Purpose and Need. How will post-harvest mortality monitoring for removal of dead trees be executed? Is it expected that multiple entries (multiple sales) over the same area(s) be needed to accomplish your Purpose and Need? How will this be done economically and has this scenario been adequately addressed in the Cumulative Impacts? Only cutting the brown needle or no-needle trees will produce a result that falls short of your Purpose and Need.

Response: The project uses the "Marking Guidelines for Fire-injured Trees in California" (Smith and Cluck 2011), along roads proposed for hazard tree removal. The proposed action and project alternatives were designed to balance active management with the retention of important attributes of post fire habitat. The conservative approach to remove dead trees with no green needles (as visible from the ground) is designed to maximize the preservation of live trees in the burned landscape by substantially reducing the risk of cutting a tree that would not have succumbed to its injuries. Salvage treatments have been focused on areas with greater than 90% basal area mortality and strategic areas. Because the majority of the fire area proposed for

treatment (greater than 80%) occurs in areas with greater than 90% basal area mortality it was identified by the Forest Service that using marking guidelines that would remove additional mortality is not needed to meet the purpose and need over the majority of the project area.

Removal of dead trees after initial salvage and fuel treatments will be determined based on fuels loading, economic feasibility, and resource impacts. Future mortality that threatens safety may be felled and left in place if removal is not feasible. Because the majority of proposed salvage is within areas where most or all trees are dead, the likely places that additional salvage logging would occur is the roadside areas within the moderate and low severity fire areas where additional impacts would be minimal and are within the analyzed impacts.

Sensitive Plants

62. Comment (Commenter 19): **Protection of Lava Caps -** Of particular concern to CSNC is the protection of lava caps in the burned area. Lava caps are unique geological formations that support sensitive plant communities. Historically, timber sale operators have taken advantage of these flat, clear openings in the forest to use as log landings. Many, if not most, ENF lava caps used as landings have lost all value as sensitive habitat and become, instead, weed infested patches. We urge that these unique habitat types be protected under all alternatives and that using them for log landings or equipment parking be strictly prohibited.

Response: Lava cap boundaries were identified and mapped in the field during project botanical surveys. In addition, high-resolution aerial imagery was used to verify boundaries and map additional lava cap units within and outside of treatment units within the fire perimeter. Survey results and updated data have been incorporated into the botany reports. Protection of lava caps is identified in the design criteria for the project (BR-2) on page 33 of the FEIS and will cover all areas newly identified as lava cap.

63. Comment (Commenter 4): CNPS wants to emphasize the important role that native plants play in preserving the integrity of forest ecosystems. The 5 foot radius limitation to herbicides described in Alternative 5 will help minimize the infestation of invasive plants in the planting units. It also decreases, relative to other alternatives, impacts to early successional species by maintaining the on-ground presence of native vegetation in-between the groupings of planted conifers.

Response: Based on the literature it is not clear that herbicide use would decrease the presence of native plants as described in the comment. As discussed in the FEIS, with the proposed herbicide application:

> "*Over the short term, plant abundance may be affected by herbicide treatments, but no plant species would be expected to be eliminated from release treatments. Sites with reduced shrubs may have increased plant diversity and species richness compared to stands that are left untreated or only radially released. Battles et al. (2001) found that at the Blodgett Research Station in Georgetown, California, understory species richness was significantly greater in managed plantations than in less intensive treatment types. In mixed forests in Canada, Sutton (1993) found no detectable effect on species composition 10 years after herbicide treatments. DiTomaso et al. (1997) in northern California found no long-term detrimental effect on vegetative cover or species evenness with herbicide use. They also found that, in areas without herbicide treatment, biodiversity and, to a lesser extent, species evenness had not recovered after 14 years, in contrast with herbicide treated areas. Mcginnis et al. (2010) included both the Cleveland and Star Fires on the Eldorado National Forest in their study plots and found that grass and forb*

cover increased in plots that had been treated with herbicide, but where alien plants were present, their cover was significantly increased over areas where herbicide was not applied." (FEIS, pgs. 208 to 209)

Soils

64. Comment (Commenter 20): Chap 2, p. 2-7 Watershed Sensitive Areas: states that criteria for delineating and evaluating watershed areas includes: potential to impact water quality, burn severity, slope greater than 15 percent among other characteristics. The Rubicon Canyon meets all these criteria. Given that Placer County is fearful that they will have to spend between $3 million and $10 million to dredge reservoirs located downstream from the Rubicon Canyon burn area, why is there nothing planned for that area other than a prescribed burn in five to seven years time? Surely, some treatments to reduce sediment runoff from the greater than 35% slope, as well as stream-bank erosion mitigation, should be considered.

Response: The Forest Service acknowledges the concerns of the commenter and will continue to collaborate with PCWA to improve the watershed condition within the King Fire.

The Forest service recognizes the sediment potential from the King Fire and has developed design criteria in all areas of proposed activity to decrease sediment levels near or below those occurring before proposed activities. This includes post-harvest soil groundcover requirements in logging units, disturbance obliterations, road reconstruction, coarse woody material additions to deficient channels, and WSA treatments within the Rubicon Watershed. In addition to activities identified in this project, BAER efforts including stabilization of areas with hand crews, road stabilization activities, and the application of 1,000 acres of aerially applied mulch have occurred within the Rubicon drainage and are providing effective reduction in erosion in treated areas.

Much of the Rubicon drainage does fit the criteria for selection of WSA treatment areas. WSA treatments proposed in the King Fire Restoration Project are located in areas adjacent to perennial and intermittent channels and unstable slopes where slopes would allow treatment either by hand or mechanically. Despite the recognition by the Forest Service that the Rubicon drainage does present a risk for sedimentation and erosion into the stream channel, many of the perennial and intermittent channels in this drainage are on very steep inoperable ground that cannot safely or effectively be treated with this project.

65. Comment (Commenter 6): Soil Stabilization, pages 3-137 through 3-143: Even with the drought which has prevailed since King Fire, tons of topsoil have been eroding from severely burned areas and entering Rubicon River, as indicated below with photographs taken by PCWA personnel between April 27 and 29, 2015. This extraordinary erosion from severely burned areas has been corroborated by US Forest Service soil scientist.

Soil is the primary resource of the watershed, forming the base of all terrestrial ecosystems by providing accessible nutrients, water-holding capacity and structural support.

Eroded soil not only removes the base of healthy forest ecosystems; it contaminates the riverine ecosystems into which it washes, and degrades the quality of water for all creatures, including humans, who rely upon it. The high quality amphibian and trout habitats of Rubicon River are being degraded by siltation, and the integrity and operation of public water and hydroelectric generation infrastructure will continue to be affected by sediment and debris from King Fire for years to come.

Soil and debris from King Fire which have already been eroded into Rubicon River will continue to move downstream during high flow pulses, impacting infrastructure and riverine habitats. Soils and debris from King Fire which have eroded from severely burned areas into channels tributary to Rubicon River will continue to enter the river during storms and to move downstream. Soil in severely burned areas, which is not protected with cover, will continue to feed this devastating pattern of erosion and sedimentation for years.

PCWA encourages and supports urgent efforts to stabilize soils which were severely burnt in the King Fire before more erosion occurs with this coming rainy season and in the next several years, before soil cover from significant revegetation can occur.

Soil stabilization should be prioritized and implemented as soon as possible. PCWA appreciates and encourages expediting the implementation of activities such as those described in the Proposed Action which will serve to quickly protect and stabilize soils affected by King Fire.

Response: The Forest Service appreciates the support from PCWA for the implementation of activities to increase soil stabilization.

66. Comment (Commenter 15): We recommend that the FEIS incorporate additional measures and information, as discussed below.

EPA appreciates that the Forest Service included, in the DEIS, a robust look at soil cover in the context of erosion. The DEIS also discusses the role of soil quality in water retention/absorption and the ability of the project area to provide nutrients to trees and other plant life in the forest. It notes that the King Fire was detrimental to the soil in the project area due to soil burn from intense heat that destroyed organic matter. We understand that, given the severity of the fire, many areas to be replanted may no longer have sufficient plant life to naturally deposit organic matter quickly enough to sustain new growth; however, it is unclear whether any measures are planned to mitigate for the lack of nutrients, bacteria, or fungi in the soil. We recommend that this be clarified in the Final EIS.

Response: The Forest Service does not intend to augment soil nutrients volatized during the fire. Most of the plant available soil nutrients are stored in the soil organic matter analyzed on page 192 of the FEIS. The Forest does expect recovery of nutrients to occur naturally. Recovery will not be immediate but it will occur in this fire adapted system. Shrub establishment occurring in portions of the forest and establishment is primarily by nitrogen fixing shrubs and forbs such as deer brush, bear clover and lupine species. It is expected that eventually all areas will establish with some vegetation.

Soil organic matter is expected to recover regardless of management activities in the long term with pre-fire levels being attained within 50-100 years. Soil organic matter is expected to recover more rapidly in areas where it was displaced by fire, because nutrient cycling of ash and rapid vegetation regrowth of root dense, nitrogen-fixing shrubs will facilitate deposition of organic matter by decomposing roots and mineralization of decaying material in the soil.

Society, Culture and Economy

67. Comment (Commenter 30): Second, increased revenue from timber sales in alternative four, from the fire area, will produce approximately 222 million board feet of timber that could be harvested. This marketable timber could help in the recovery of the burned area. The revenue

from the timber will help to provide new trees that will restore the forest to its natural beauty that all Californians and its native wildlife need to prosper.

Response: The Responsible Official will consider your input when making his decision.

68. **Comment (Commenter 7)**: Agri-tourism is very important to our economy... and the media had quite a time talking about the horrors of the 97 thousand acres burned in the American River watershed, 1.1 billion board feet of saw timber, thirty wildlife 'protected activity centers' for sensitive species damaged, the American Fire in the Tahoe National Forest, the Star fire, Fred's Fire, the Sand and King fires..[not to mention the Rim fire], mostly showing 70 foot high flames, and complaining of all the smoke that drifted down to the valley. During the fire storm the Forest Supervisor of the El Dorado National Forest was shown on the news daily exclaiming that "5 million dollars a day" was being spent to fight the fire. Add that to the several million for temporary restoration work and many more millions spent on hand-wringing as to what to do next. So here we are, after only twenty or so years of no management on the national forests and single species protections, contributing to the loss of California's portion of the national forests to fire at the alarming rate of 1/2 million acres per year; all without a prudent plan to reforest or manage them for the future.

    Without plans for reforestation and restoration of the watershed our worst fears will finally come to fruition. This once beautiful and productive forest will be lost for several generations to land-strangling brush, favoring few species of wildlife, sequestering little carbon compared to the long term capture of CO2 by timber and increasing the probability of the boom-and-bust environmental disasters of fire and flood.

    Response: The Responsible Official will consider your input when making his decision.

69. **Comment (Commenter 10)**: Another benefit to Alternative 4 comes in the form of expected return on Forest Service investment. CORVA believes that the Eldorado National Forest has to incorporate potential cost of treatment along with potential cost recovery as part of the equation in the development of a proposed action. In this time of shrinking Forest Service budgets, Alternative 4 offers the forest the most potential in cost recovery, making it the logical choice as the proposed action.

    Response: The Responsible Official will consider your input when making his decision.

70. **Comment (Commenter 23)**: Our forest is very important to El Dorado County for its historical, economic, recreational, cultural, and natural resources. Given the drought and poor past management practices we ask that the Forest Service do the most that they can to clean up our forest. In the future the Forest Service needs to work with our local jurisdiction and local stakeholders to promote a more healthy forest. It seems that putting a biomass plant near SMUD's power generation plant in order to clean up an overgrown forest would have been more cost effective than the cost to suppress and restore the damage caused by the King Fire.

    Response: The Responsible Official will consider your input when making his decision. Funding a biomass processing plant is not within the scope of the decision.

71. **Comment (Commenter 6)**: Economics, pages 3-71 through 3-74: Achieving the goals of stabilizing soils, restoring healthy watersheds and promoting long-term fire resiliency in areas severely affected by King Fire requires significant financial input. PCWA encourages and supports US Forest Service in its professional management of the renewable timber resources under its purview to efficiently and continuously optimize financial input toward implementing activities such as those discussed in the Proposed Action which will accomplish immediate soil stabilization, long-term fire resiliency, and restoration of enduring healthy watersheds.

Response: The Responsible Official will consider your input when making his decision.

Transportation System

72. **Comment (Commenter 2)**: Alternative 4, (p. xv) -- CFA believes there is a great deal of merit in portions of Alternative 4 specifically where:

"This alternative increases treatments in strategic locations to establish and maintain a reduced fuel profile for future fire suppression, changes fire behavior, and improves management of natural and prescribed fires. Alternative 4 modifies the proposed action by adding Strategically Placed Area Treatments (SPLATS) to enhance SFMZs, adding fuel treatment areas along private property, adding dead tree removal and fuel treatment within 100 feet each side of Level [p. viii Table S1 shows Level 2 roads are included] 3, 4, and 5 roads open to the public and by adding to the conifer forest resiliency areas."

Some Level 1 roads are also included in one or more action alternatives (p. 2-5).

Response: The Responsible Official will consider your input when making his decision.

73. **Comment (Commenter 2)**: A provision should be included that allows use of water storage tanks while following the minimum flow requirements for drafting to fill the tank.

Response: The Responsible Official will consider your input when making his decision.

74. **Comment (Commenter 3)**: An easement was granted to the Forest Service for Spring Valley Road #11N64, Case #413 (Feb 4th, 1974) with conditions that include my use of this road and the reconstruction, right-of-way, and handling of timber along the roadside as needed to maintain this right of way. I want to know that the efforts proposed for the King Fire Restoration Project include intention to reconstruct--including the repair/replacement of culverts removed leaving dips after the disaster--a level graveled or tar-surface road. This road had a tar surface in the late 70's but was allowed to decay and has been maintained as a rock-covered road since the 1980s. Either/or is acceptable based on your determination of what is best to maintain.

Response: The Spring Valley Road was largely reconstructed in the spring of this year by the Forest Service. The reconstruction was essentially justified on the basis that some damage to the road occurred during the King Fire suppression efforts. Since it would have been impossible to separate the fire suppression damage from the cumulative damage caused by years of use and insufficient maintenance associated with year-around use by local residents and other members of the public, the Forest Service proceeded and completed nearly $60,000.00 of

road reconstruction work that included application of road rock, grading, compaction rolling and ditch work. If the Forest Service uses this road for the King Fire salvage operations, the road will be maintained, including watering and grading, commensurate with use, but no further reconstruction is contemplated on the section of road that is most likely being commenting on. During the forthcoming winter months the Forest Service will continue to monitor the functioning of the existing culverts and ditches and perform maintenance work or replacement work based upon actual need.

The section of the Spring Valley Road, west of the McManus intersection has never been chip sealed, asphalted, "tarred" or similarly surfaced and the Forest Service has no plans or intention to surface it now or in the future. This section of road was partially rocked by the Forest Service an estimated 30 or more years ago for the 1st time and then re-rocked in about 1999 on the Whale Rock Timber Sale. Prior to these rocking efforts, the road was simply a relatively low use, native surfaced road serving the timber sale program and the relatively few residents living along this road. The short section of road east of the above the described intersection to the Peavine Ridge Road is currently a chip sealed road and will be maintained as such into the future by either the Forest Service or by El Dorado County (there is some contention over which government entity actually has the responsibility for maintaining this section of road.)

The general maintenance policy of the Forest Service on all roads is that the party that uses the road needs to perform or pay for the road maintenance needs commensurate with their use. During periods of commercial use, such as the hauling of Forest Service or Sierra Pacific, the timber operators are obligated to water, grade and maintain the road based upon their degree of use.

75. Comment (Commenter 12): It is well established that there is a direct correlation between roads, vehicle use, and delivery of fine-grained sediment to stream channels; therefore, we are particularly concerned with management actions that affect roads and landings.

Relative to system roads, we noted that no roads are proposed for decommissioning (Appendix F, page 7). In concert with 36 CFR, Part 202, Subpart A (36 CFR 212.5(b)) of Travel Management, within the project area, the EIS should identify the minimum road system needed for safe and efficient travel for administration, utilization and protection of National Forest System lands and discuss the potential for the removal of unnecessary, high risk roads. We believe that it would more beneficial and cost efficient to assess compliance with Subpart A during the King Fire Restoration Project analysis than to duplicate the NEPA effort at a later date, particularly since the WO has mandated that the Subpart A analysis be completed by September 30, 2015.

The EIS must delineate the location and mileage/area of all roads and landings subject to haul, construction, reconstruction, and/or maintenance, particularly those within Riparian Conservation Areas (RCAs) so that the public can make informed decisions regarding their direct, indirect, and cumulative impacts on riparian and aquatic resources.

Response: It is outside the scope of this project to assess compliance with Subpart A of travel management. Subpart A is an analysis effort, not a NEPA decision. Routes open for public use were documented in the 2008 Decision for Wheeled Motor Vehicle Use on the Eldorado National Forest.

Appendix D (Road Repair and Maintenance) of the FEIS lists the roads and associated mileage on which maintenance and/or repair would occur, and maintenance and repair activities are described on page 15 of the FEIS. Design Criteria for use and construction of skid roads and

landings is described on page 27 of the FEIS in Table 2.15. These design criteria, along with BMPs in Appendix F, will adequately protect riparian and aquatic resources.

No new system roads would be constructed, and temporary roads and skid trails used for the project would be decommissioned after use. Existing skid trails and landings would be reused to the extent possible to minimize construction of new landings. The size and location of landings would be determined during sale layout consistent with design criteria and direction in FSH 2409.15_60. In addition to project design criteria, FSH 2409.15_60 describes Forest Service policy for location and use of landings and skid trails by a contractor. Per FSH 2409_15_60, the purchaser and Forest Service must agree to acceptable locations for all tractor roads and skid trails. Furthermore "*The Sale Administrator shall participate with the Purchaser/Field Representative to select landing locations which are mutually acceptable. Landing locations must be compatible with necessary truck road locations, the skidding plan, timber felling leads and resource protection requirements*" (p. 34).

76. Comment (Commenter 20): Chap 2, p. 2-8 Roads: states that no new roads will be constructed. Given that the USFS has stated it wants to take a more active forest management approach in the future to reduce the likelihood of more catastrophic fires, would it be prudent to consider that some of the temporary roads needed for salvage logging might also be useful for future thinning and stewardship logging contracts? Just as some of the firebreaks constructed during the fire should be the starting point for the future fire resilient landscape, these "temporary" roads might be considered the starting point for a permanent needed road network.

Response: As stated on page 15 of the FEIS the project proposes to: "Construct no new system roads. Temporary roads may be constructed to access landings. Following use, any cut or fill slopes will be reshaped into surrounding slope and temporary roads will be scarified, drained, and blocked to vehicular traffic."

Subpart A Travel Analysis is currently being completed at a 'forest scale'. The Forest is taking a broad look at the whole road system and the associated risks and benefits to users and resources across the Forest. The process will identify potential opportunities for changes to the road system. Inputs to the process include ecological, social, cultural and economic information. Subpart A findings will inform NEPA analysis in the future.

77. Comment (Commenter 19): As you complete a restoration strategy for the King Fire, the Eldorado NF concurrently must also complete its Subpart A Travel Analysis Report, including a list of "likely needed" and "likely unneeded" roads, due by September 30, 2015. The TAR offers an opportunity to ensure that the bloated road system, which exacerbated sedimentation and debris flows in the King Fire area, is addressed and future negative impacts minimized, as part of the restoration project.

Response: The Travel Management System within the affected area is being reviewed in accordance with Subpart A.

78. Comment (Commenter 19): Because many drivers of off-road vehicles are opportunistic, we fear the open terrain of the burned landscape may prove irresistibly inviting and be further damaged. We suggest dropping and leaving trees strategically, both to minimize downslope soil movement and to discourage off-route joy riding, wherever that potential exists.

Response: The Forest Service agrees with the commenter and has modified Design Criteria WS-8 as shown below.

WS-8	Screen Protection Measures for Trails and Roads	To discourage pioneering OHV travel off system trails, leave a 10-foot screen on both sides of system trails in proposed units. Screens would consist of retained surface material and standing non-commercial trees where available. Where feasible and within fuel design criteria, leave uncut downed wood adjacent to roads to discourage unauthorized OHV travel.

Watershed

79. Comment (Commenter 13): Summary of Environmental Consequences- Table S.2 (DEIS pg. xxiii)

Resource and Indicator		Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3	Alternative 4	Alternative 5
Watersheds	Water Quality (Erosion and Sedimentation)	No direct ground disturbance Erosion and sedimentation remain high for next 1-7 years as watersheds recover from fire Erosion from existing disturbances would continue, no road improvements or WSA treatments	Negligible change in erosion compared to Alternative 1 due to impact of wildfire itself Short-term increase in erosion from ground disturbance. Long-term reduction in erosion due to groundcover additions, WSA treatments, obliteration of past disturbances, and improvements to road system	Similar to Alternative 2, though slightly less short-term erosion due to reduction in treatment area Slightly higher long-term erosion due to reduction in extent of groundcover treatments	Similar to Alternative 2, though slightly more short-term erosion due to increase in treatment area Slightly less long-term erosion due to increase in extent of groundcover treatments	Same as Alternative 2

The above table provided on pg. xxii of the DEIS implies higher levels of erosion per more treatment acres due to ground disturbing activities. Sierra Pacific Industries recently completed a soil erosion study (post-fire) that suggest the opposite.

Data collected by Sierra Pacific Industries during Water Year (WY) 2013 and contained in Post-Wildfire Salvage Logging, Soil Erosion, and Sediment Delivery- Ponderosa Forest Fire, Battle Creek Watershed, Northern California (James, 2014) suggests that site disturbance eliminates soil hydrophobisity, increases rainfall infiltration, reduces runoff velocity, shortens the hillslope length, and thereby substantially reduces overall average soil erosion and sediment delivery. In summary, the data shows that salvage logging and contour subsoiling can result in less soil erosion and these treatments should be considered in post-fire restoration projects.

Response: There are conflicting conclusions from research regarding the effect of salvage logging. Wagenbrenner et al (2015) concludes there is more erosion resulting from salvage logging. In reality, some areas will have reduced erosion and some areas will have increased erosion depending on post-salvage cover, site conditions, and operator skill level. Soil design

criteria and proposed activities were developed with consideration of the higher impacts predicted by Wagenbrenner et al (2015) to ensure greater soil protection. The Soils effects section of the FEIS has been updated to incorporate findings from the James (2014) study.

Wildlife

80. Comment (Commenter 2): CFA believes that California Spotted Owl surveys that have been on-going since March 2014 will show that the Owl has moved from the High Severity Burned Area to adjacent green trees that survived the Fire and then are foraging in the high severity burned area.

These surveys may show that the burned PACs are obsolete and that a 0.7 mile buffer from previous nest sites is not relevant. Since the Forest Service now has a Memorandum of Understanding with Sierra Pacific Industries (SPI) to share owl data, the Eldorado Natl. Forest should incorporate findings from the 20 or so pairs of owls that have been surveyed the past several months on SPI's burned property and incorporate that information into an owl strategy for high severity burned National Forest land. SPI will near completion of salvaging their high severity burned property fall, 2015. Many thousands of acres have already been salvaged with some also having site-preparation, contour-tilling, and planting of seedlings. Owl survey information within these areas should be of exceptional value to the National Forest's owl strategy.

Response: Owl surveys began in the project area in March 2015 and the results to date show that CSOs have primarily been detected in or near low or mixed severity burned areas. Owls could be foraging in the high severity burn, but the extent of the use of those areas is unknown. It is inconclusive if burned PACs are obsolete where surveys lack detections because not every territory is occupied every year and there has only been one breeding season post-fire. It is possible that owl territories are shifting and may take a few years to reestablish, especially in areas that were most impacted by fire, such as those where all nests sites were lost, individuals died, or the majority of the pre-fire territory was subjected to high severity fire. Additionally the PAC retention guidelines direct the Forest to maintain PACs if there is sufficient (300 acres) suitable habitat remaining within 1.5 miles of the (most recent best status) activity center per SNFPA ROD (page 37). The Forest has been in communication with SPI biologists to coordinate survey efforts and exchange survey data. There are no plans to make an owl strategy for high severity burned Forest land, but a broader CSO conservation strategy update is under development. The DEIS appendix G provided an assessment of the CASPO PACs with explanations on status and acreage figures. This is updated for the FEIS based on 2015 survey data which triggered PAC modifications.

81. Comment (Commenter 2): Snag retention of 10% seems unnecessary since there will be at least 65% of untreated high severity burn acres (hence 100% snag retention) within the burn perimeter. For harvest units with snag retention, they should be retained in clumps so as not to be a hazard to tree planting activity. If they're scattered and a safety hazard to tree planting, they'll be cut down.

Response: Snag retention of 10% of the treatment areas was adopted to promote heterogeneity and minimize negative effects to early seral species across the project area. Snag retention in harvest units would be retained in clumps. Refer to Appendix G of the FEIS for a description of the general principles for snag retention.

82. Comment (Commenter 15): On June 20, 2014, President Obama issued a memorandum directing Federal departments and agencies to evaluate and use their resources, facilities, and land management responsibilities to expand knowledge of pollinator health and to increase habitat quality and availability. While the DEIS acknowledges impacts to pollinators such as bumblebees, it is unclear what mitigations would take place during the initial action to prevent adverse impacts to pollinators. In May 2015, the Forest Service released a draft document in response to the President's memorandum, titled "Pollinator-Friendly Best Management Practices for Federal Lands", which states that "Eight broad considerations are key when evaluating projects for conserving pollinator habitat:"

- determining the quality of foraging habitat;
- identifying important pollinator reproduction sites;
- determining important nesting and overwintering sites;
- identifying pollinators of sensitive or at-risk plant species on Federal, State, local, or nongovernmental organization (NGO) (e.g., Nature Serve) lists as outlined in the National Academy of Sciences report on Status of Pollinators in North America.
- identifying and removing invasive species to improve pollinator habitat;
- identifying, collecting, and using local, genetically appropriate native seeds;
- implementing adaptive management; and
- engaging and informing the public."

We recommend that the FEIS reflect these best management practices to support pollinator health and affected ecosystems.

Response: The Pollinator-Friendly Best Management Practices for Federal Lands (11 May 2015 draft) is intended to assist interdisciplinary teams (IDTs)… by providing them with a range of BMPs appropriate to different resource categories. It is not considered a policy document, but as guidance that agencies can use as they implement management actions tied to specific agency missions. The most relevant parts of the document to this project are sections about: Thinning and Understory Shrub Control in Forests, Managing Wildlife Openings To Improve and Sustain Pollinator Habitat, Pesticide Use, and Prescribed Burning. The Project did indirectly incorporate some BMPs through botanical project design criteria (FEIS Table 2.15 Summary of Design Criteria on pages 33 and 34, BR-10 to BR-16, Invasive Species), specifically through specifications about Pre-Implementation Treatments, Monitoring, Risk Minimization Strategies, Flag and Avoid Sensitive and Watch List Plants, Equipment Cleaning, Certified Weed-Free Materials for Roads, and Certified Weed-Free Erosion Control Materials. BMPs are also incorporated partially through the monitoring project design criteria, but primarily through adherence to NEPA direction that incorporates adaptive management and public engagement. The guiding principles and description of the Project's reforestation strategy provide further details on post-treatment plant composition (FEIS page 11 and Chapter 3, page 208, and Table 2.6 Desired Stand Condition and Initial Planting Density by Location page 16).

California Spotted Owl (CSO)

83. Comment (Commenter 20):

- 75% of the spotted owl habitat lost between 1994 and 2003 was because of fire (Courtney, S.P., et al, Scientific Evaluation of the Status of the Northern Spotted Owl,

2004), much of that from decades of fire suppression. The King Fire swept through the middle of the CSO habitat that has been under study for many years, resulting in high severity tree mortality over a large area, destroying nesting sites and birds.

- Chap 2, p. 2-2 point 4: restricts salvage logging within 0.7 mi of the CSO territory center. Given the bullet point immediately above, if we want to prevent further CSO habitat destruction, I would recommend that careful thinning of understory be done within the surviving PAC areas, to reduce fuel ladder potential. This could be done as hand work and scheduled out of nesting season so as to disturb the owls as little as possible.

Response: The Responsible Official will consider your input. Only dead, dying, and damaged trees are being considered for removal to meet purposes of the project and needs in the fire area such as hazard mitigations, restoration of severely burned areas, and establishing future forests. Much of the post-fire PACs are on the fire's edge in the mixed severity burned areas considered to be within the natural range of variability so fuels reduction was not proposed, but future actions could include reducing ladder fuels. Professional opinions and literature are mixed on the suggestion that thinning prevents further CSO habitat destruction. Some scientists and biologists believe salvage harvest in CSO territories would impact CSO foraging habitat and lead to loss of occupancy. Salvage logging will occur in areas closer than 0.7 miles from CSO territory center if that area coincides with a strategic fuel management zone (SFMZ) or roadside hazard tree reduction.

Support for Alternative

84. Comment (Commenter 4): The El Dorado Chapter of the California Native Plant Society (CNPS) recommends the selection of Alternative 3 modified by using the approach to herbicide application described in Alternative 5 for implementation in the King Fire Restoration Project. This combined alternative would:

- Protect native plants between planted tree clusters
- provide for the greatest protection among the alternatives for complex early seral forests

Our modified Alternative 3 (footprint of Alternative 3 with herbicide approach from Alternative 5) doesn't provide as much protection of the native plant communities within the planting units as Alternative 3 but we recognize it may provide for greater tree survival than Alternative 3 does.

Response: The Responsible Official will consider your input when making his decision.

85. Comment (Commenter 22): I appreciate that the radial spray release was included as an alternative in the King Fire Restoration Project. I would like to see this approach used as described in Alternative 5 in any 'herbicide' alternative selected.

Response: The Responsible Official will consider your input.

86. Comment (Commenter 20): Alternative 4 will do the most to improve overall forest health, protect wildlife habitat and reduce the danger of another catastrophic fire in the El Dorado National Forest.

Response: The Responsible Official will consider your input.

87. **Comment (Commenter 20)**: **Alternative 4 -**This alternative does the most to improve forest health, reduce fire danger and protect wildlife habitat. The same comments for Alternative 2 would apply to this one. Additional treatment acreages would be a good idea, and a complete revisit of the proposed Rubicon Canyon treatment is definitely required. There needs to be a larger salvage and reforestation effort, not just at the canyon rim; and heavy soil erosion treatments and stream-bank erosion mitigation need to be made a high priority.

Response: The Responsible Official will consider your input.

88. **Comment (Commenter 30)**: On behalf of El Dorado County, I am pleased to report that our board has decided to support alternative four in the Project Draft Environmental Impact Statement for the King Fire, which would increase treatments in strategic locations to establish and maintain a reduced fuel load for future suppression, change fire behavior, and improve management of natural and prescribed fires.

First, alternative four reduces forest fuel loads by creating Wildland Urban Interface Defense Zones, Strategic Fire Management Zones, Conifer Forest Resiliency Areas, and Strategic Roadside Buffer Zones. These strategies will make the forest a safer place for many different stakeholders: workers that tend to the forest for routine maintenance and during emergencies, residents that live near it, recreational enthusiasts, and the animals that call it home. Without deploying these strategies at the levels in which alternative four recommends the likelihood that these stakeholders will be put back in a life threatening situation due to a super fire will increase significantly.

Response: The Responsible Official will consider your input while making his decision.

89. **Comment (Commenter 4)**: In other recent wildfire reforestation projects a similar alternative to the application of herbicides has been offered but not selected by the deciding official. The El Dorado CNPS Chapter is optimistic that this time will be different and the new Forest Supervisor, will choose Alternative 3 modified if necessary by using herbicides, but ONLY within the 5 ft limited radius described in Alternative 5 for implementing the King Fire Restoration Project.

Response: The Responsible Official will consider your input while making his decision.

90. **Comment (Commenter 7)**: I am writing this letter to request that you implement Alternative 4 for the King Fire Restoration Project. This alternative treats the most burned acreage of the five alternatives presented in the DEIS. This will do the most toward fuel reduction and lessen the risk of a future re-burn in the El Dorado National Forest.

I'm a member of Farm Trails and spend much of my time supporting the El Dorado County Farm Bureau, the Visitors Authority and El Dorado County Farm Trail Association and our Chamber of Commerce. I have seen first-hand the devastation and know the real threats of fire. I am a survivor of the Sand Fire.

The choices we have now are due in large part to past planning for the future with Forest Management. These choices are being eliminated with each fire, becoming larger and more devastating that the last. I urge you to implement Alternative 4 for the King Fire Restoration Project... and the sooner the better, least we have a bare and dead land left for our children and for the economy of California.

Response: The Responsible Official will consider your input while making his decision.

91. Comment (Commenter 8): This is why I urge you to select Alternative 4, for the King Fire Restoration. I must add, however, that I still do not think that this alternative goes far enough and I do hope that the recent catastrophic forest fires, will motivate the Forest Service and our elected representatives, to return to the practice of healthy, forest management. Please select Alternative 4.

Response: The Responsible Official will consider your input while making his decision.

92. Comment (Commenter 14): I like alternative 5 because of the reduced herbicide on potential essential herbivore browse particularly the species of ceanothus, gooseberry, and other critical plants. I'm interested in a balance of trees and wildlife particularly our struggling and dwindling West Slope migratory deer herds. The forest is more than just a giant "tree farm". There needs to be open areas for meadows and brush. A mosaic is best for all species and we certainly do not want monocultures.

Response: The Responsible Official will consider your input while making his decision.

93. Comment (Commenter 16): We have reviewed the Notice of Scoping for an Environmental Impact Statement (EIS) for the Proposed King Fire Restoration Project documents. The District supports Alternative 2 which has identified areas for treatment within Strategic Fire Management Zones and the Wildland Urban Interface (WUI)(EIS Table 2.1 and 2.2): WUI defense zones where increasing fuel loads pose a hazard to community fire protection; strategic fire management zones which include areas identified to establish a safe and effective place for future fire suppression; forest resiliency areas where reestablishment of conifer forests is desired, ecologically sustainable, and can be managed to have a high probability of surviving subsequent wildfire; and other specific areas where treatment would occur for hazard removal, research and watershed improvement.

Alternative 2 presents an opportunity to connect proposed restoration activities within Strategic Fire Management Zones and the Wildland Urban Interface that are consistent with the treatments proposed on private non-industrial forest lands effected by the King Fire.

Response: The Responsible Official will consider your input while making his decision.

94. Comment (Commenter 10): We still believe the analysis could have taken a bolder approach to encompass a larger area in proposed restoration activities, therefore CORVA supports Alternative 4. We believe Alternative 4 offers the greatest opportunity for the forest to start meaningful recovery from the King Fire by allowing the greatest amount of serious on-the-ground treatments. Also, Alternative 4 offers the greatest benefits to local communities in terms of future fire resiliency while giving the most protection for workers.

In the document there is insufficient reasoning to indicate why Alternative 4 could not be chosen as the proposed action. The additional treatments as proposed in Alternative 4 will do the most to protect both private properties and forest land while still protecting the natural environment and allowing for an acceptable amount of habitat and species retention.

Alternative 4 appears to provide for the ecological needs of wildlife species by retaining the same amount of snags in the target area as the proposed action. CORVA specifically supports the proposal to replant the target area in a manner that will be more resilient to the advent of future fire activity. In reviewing the DEIS, CORVA also supports the measures proposed for species retention and recover in regards to black-backed woodpecker and spotted owl in Alternative 4.

The forest presents in Alternative 4 a balanced solution for forest recovery, protection of local interests coupled with the protection of wildlife and habitat resources. We encourage the Eldorado National Forest to either adopt Alternative 4 as the proposed action or a modified Alternative 4 that exhibits a similar appropriate balance in land use planning.

Response: The Responsible Official will consider your input while making his decision.

95. **Comment (Commenter 18)**: The El Dorado Irrigation District supports the ENF efforts to reduce the risk from falling dead, dying, and damaged trees that pose a significant safety concern to workers and create a hazard to infrastructure. The District appreciates the ENF efforts to actively manage the forest resources to aid in the prevention of future wildfires in the area affected by the King Fire. The District supports the ENF implementation of the Project as it relates to the District's ability to ensure the continued safe and reliable operation of its Project No. 184 and water conveyance facilities

Response: The Responsible Official will consider your input while making his decision.

96. **Comment (Commenter 29)**: Fire happens, and nature is designed for recovery. I support the 'no action' alternative first. Given the political climate, if 'no action' is not truly a choice, I would support the next-least-impact alternative, which looks like alternative 3, but the US foresters would know that best. Please do not make this decision based on economics of the logging industry; any action should be solely to favor the natural environment, which shouldn't need a whole lot of intervention from us.

Response: The Responsible Official will consider your input while making his decision.

97. **Comment (Commenters 23 to 27)**: Given the significant importance the forest has to the custom, culture, and economic stability of El Dorado County, we ask that the Federal government choose the strongest alternative possible, in this case Alternative 4, to restore our forest and watershed back to health.

Response: The Responsible Official will consider your input while making his decision.

98. **Comment (Commenters 28)**: On behalf of the Placerville Tea Party Solutions Committee, I urge the adoption of plan #4, the most extensive restoration proposal.

Response: The Responsible Official will consider your input while making his decision.

99. Comment (Commenter 2): Recognize that Alternative 4 is the only alternative that restores about 2/3 of the high severity burned area to a forested condition.

Response: The Responsible Official will consider your input while making his decision.

100. Comment (Commenter 6): PCWA supports and encourages timely implementation of the Proposed Action - Alternative 2 - described and discussed in the DEIS. Specifically, we provide comments on the following sections:

Safety and Public Use, pages 3-116 through 3-119: PCWA supports the implementation of efforts described in the Proposed Action to reduce the risk from falling, dead, dying and damaged trees that pose a significant safety concern for utility workers and the recreating public accessing or traversing fire-affected public lands, and infrastructure associated with water storage, power generation and transmission.

Response: The Responsible Official will consider your input while making his decision.

101. Comment (Commenter 15): The U.S. Environmental Protection Agency has reviewed the Draft Environmental Impact Statement (DEIS) for the King Fire Recovery Project, Eldorado National Forest. Our review is provided pursuant to the National Environmental Policy Act, Council on Environmental Quality regulations (40 CFR Parts 1500-1508), and our NEPA review authority under Section 309 of the Clean Air Act.

EPA supports the project's objectives of maintaining ecological integrity, strategically reducing future fuel loadings and increasing the forest's resiliency to fire, reducing safety hazards, furthering restoration and research activities, and reducing sediment inputs to streams. We understand that the current conditions in the Eldorado National Forest are extremely vulnerable to fire, largely due to past practices such as fire suppression and planting for timber harvest rather than a diverse and sustainable forest environment, and that this vulnerability is heightened by climate change. We recognize the challenges that the fire recovery project presents, and appreciate the substantial work that went into the preparation of the DEIS.

Response: The Responsible Official will consider your input while making his decision.

102. Comment (Commenters 13): Sierra Pacific Industries generally supports the King Fire Restoration Project and urges the USFS to adopt Alternative 4. In addition, seeking Alternative Arrangements for this project will be essential to prompt project implementation. Timing is of the essence. We support the use of the Emergency Situation Determination and Alternative Arrangement authorities for this project.

Response: The Responsible Official will consider your input while making his decision.

Commenter 11 – Response to Comments

Aquatic Resources

Species

103. Comment (Commenter 11): It does not appear that the Forest Service prepared a Biological Assessment for impacts to ESA-listed aquatic species (both from effects of herbicides and from potential direct mortality from tractor logging, felling, and skidding adjacent to, or over, streams, as well as from potentially severe sedimentation/erosion that can result from ground-based post-fire logging), including the Yosemite Toad, California Red-legged Frog, Mountain Yellow-legged Frog, and Sierra Nevada Yellow-legged Frog. Indeed, research indicates that these species often travel hundreds of feet, or even hundreds of meters, from streams/wet-meadows, and could be killed by logging equipment and tree felling in the process (Matthews and Pope 1999, Pope and Matthews 2001, Fellers and Kleeman 2007, Tatarian 2008; see also D.L. Martin 2008, "Decline, movement and habitat utilization of the Yosemite toad (Bufo canorus): an endangered anuran endemic to the Sierra Nevada of California", p. 41; see also Federal Register 2010, volume 75, number 51, pages 24256-24310; Federal Register 2013, Final Rule, volume 79, number 82, pages 24472-24514).

The Forest Service has an affirmative duty under the ESA to avoid "take" of listed species, as well as consult with the U.S. Fish and Wildlife Service regarding potential impacts. The Forest Service has failed to meet those requirements.

Response: The analysis of effects to aquatic wildlife, including federally listed species can be found in Chapter 3 of the FEIS (pgs. 245 to 280). This includes detailed analysis of the potential effects to California red-legged frog (*Rana draytonii*) [pgs. 248, 249, and 263 to 267] and Sierra Nevada yellow-legged frog (*Rana sierrae*) [pgs. 249, 250, and 267 to 271]. The detailed analysis in the DEIS and the Biological Assessment included the potential effects associated with the use of herbicides; the potential direct mortality from tractor logging, felling, and skidding adjacent to riparian conservation areas; and from management induced soil erosion and sedimentation resulting from mechanical disturbances associated with proposed management activities. The project area is outside the range for mountain yellow-legged frog (*Rana mucosa*) and Yosemite toad (*Anaxyrus canorus*). In addition, there is a discussion of general effects common to aquatic species and their habitats in the FEIS on pgs. 254 to 262. Design criteria developed specifically to minimize the potential effects to California red-legged frog and Sierra Nevada yellow-legged frog are included in each action alternative (FEIS, pgs. 28 to 30).

Section 7(a)(2) of the ESA requires Federal agencies, in consultation with USFWS and the National Marine Fisheries Service (NMFS), to insure that their actions are "not likely to jeopardize the continued existence of any" listed species (or destroy or adversely modify its designated critical habitat; 16 U.S.C. § 1536(a)(2)).

As described in the FEIS (pgs.245 to 246), "Preparation of a biological assessment and Section 7 consultation with the USFWS will be required prior to a decision. Once consultation is completed, USFWS will issue a biological opinion governing protection of these species for this project." The Biological Assessment has been prepared and submitted to the U.S. Fish and Wildlife Service for Section 7 consultation under the ESA. Implementation of the project activities within identified suitable habitat for the California red-legged and Sierra Nevada yellow-legged frog (Biological Assessment) will not occur until consultation is completed with USFWS.

Design Criteria

104. Comment (Commenter 11): We request that you do not allow any post-fire logging within 1.5 km of California spotted owl nest/roost sites, except for hazard tree felling along roads maintained for public use or roads indispensable for access to private lands or critical infrastructure.

Response: An alternative considered but eliminated from detailed study was developed that would protect a 1.5 kilometer area around every spotted owl activity center, based on research conducted by Bond et al. in 2009 (FEIS, pgs. xv, 40 to 45). As described in the FEIS on pg. 44, this alternative was considered but eliminated from detailed study since it would not meet the purpose and need. For example, "…this alternative fails to meet Purpose and Need Number 2 to remove dead trees in strategic fire management areas to improve the agency's ability to manage and control future fires. This alternative fails to reduce future fire intensity and would lead to significant tree mortality in the event of a fire, hindering or reversing the growth of future forest." (FEIS pg. 44) "This alternative does not meet Purpose and Need Number 3 to actively manage severely burned areas to facilitate restoration and resilience, including reforesting severely burned areas and removing dead trees that would fall and increase the likelihood of high-severity fire. This alternative effectively eliminates nearly all the fuels treatments in the northern portion of the fire which is the most severely burned and the most in need of planting due to distance from seed sources."

In addition, as described in the FEIS (pg. 49), "This alternative is not consistent with Forest Plan Direction to design projects to manage the development of fuel profiles over time and recover value of timber killed. Salvage harvest is not proposed within post-fire spotted owl PACs (except roadside hazard tree removal) and the project was designed to limit salvage harvest within 0.7 miles of the territory center. As described in the FEIS (pg. 10), "where post-fire persistence of a spotted owl territory was expected, salvage harvest within 0.7 mile of the territory center was not proposed except for the purpose of hazard reduction and the establishment of strategic fire management zones. In response to these comments, modifications as described in the Decision have been made to further reduce treatment effects within CSO territories. Salvage harvest was reduced within 0.7 miles of the territory center of a number of owl sites. In particular, within CSO territories, salvage treatments were dropped from high severity burned forest that occurred within 500 feet of CSO habitat that remained unburned or burned at less than 50 percent basal area mortality. These changes resulted in dropping approximately 630 treatment acres in spotted owl territories, further reducing the potential for project actions to impact California spotted owls as described in the King Fire Restoration Project Biological Evaluation.

105. Comment (Commenter 11): We request that you affirmatively conduct surveys for black-backed woodpecker nests at the beginning of nesting season in 2016 and 2017 and protect a 600-meter radius zone around nests (and incorporate this into the decision).

Response: There is currently no law, regulation, or policy requiring surveys or nest protections for black-backed woodpeckers, however development of the proposed action included use of a habitat model (Tingley et al. 2014) and 2015 surveys designed to test the model through comparison of its predictions with observed occupancy patterns across the King Fire area (FEIS page 10). This survey information has been described in the Black-backed woodpecker report. The suggestion to protect a 600-meter radius zone around nests recommended by the commenter has been reviewed by the decision maker. This approach recommended by the commenter has consequences that may adversely impact certain project objectives. In order to achieve public interest in purpose and needs 1, 2, 3, and 5 there would be some unavoidable

trade-offs for wildlife. For example, conducting two years of surveys and dropping treatments around nests compromises implementation because it limits the ability to "expeditiously recover timber killed by the fire commensurate with available markets for the purpose of generating funds to offset the cost of restoration activities and contribute to societal needs for wood products (purpose and need #5)." The Forest Service has balanced multiple priorities, objectives, uses, and species in its activities as a multiple use agency. At times, certain management objectives are in tension, if not direct conflict, with one another. For example, through this Project, the Forest Service seeks to capture the economic value of burned conifers and to reduce fire hazard by removing burned trees. Yet, the Forest Service also wishes to conserve burned forest habitat for wildlife species. The Forest Service has tried to strike a reasonable balance between these two goals at the landscape level, but it is simply impossible to fully achieve both of these goals on each and every acre.

106. Comment (Commenter 11): We request that you conduct no post-fire logging during nesting season for complex early seral forest species (which are represented by the Black-backed Woodpecker, as the Management Indicator Species for CESF wildlife), as recommended by the Black-backed Woodpecker Conservation Strategy (May 1 through July 31).

Response: The Forest Service implements a limited operating period (LOP) to reduce disturbance to certain threatened, endangered, proposed, or Forest Service sensitive wildlife species during the breeding season (collectively referred to as TEPS species). LOPs are designated in the Forest Plan direction for sensitive species and as appropriate, through consultation with USFWS for listed or formally listed species. The black-backed woodpecker was evaluated by the Forest Service for the potential inclusion on the Region 5 Forest Service Sensitive Species list in 2013, but the evaluation did not result in the addition of the species to the Regional Foresters Sensitive Species list as updated on July 3, 2013 (Letter from Regional Forester).

The black-backed woodpecker is not a TEPS species in Region 5, but is a management indicator species (MIS). MIS are animal species identified regionally, developed under the 1982 National Forest System Land and Resource Management Planning Rule (1982 Planning Rule) (36 CFR 219). Guidance regarding MIS directs Forest Service resource managers to, at the project scale, analyze the effects of proposed projects on the habitat of each MIS affected by such projects There is currently no law, regulation, or policy requiring LOPs for management indicator species such as the black-backed woodpecker.

The Executive Summary of the Conservation Strategy (page 1) clearly explains that "Interest in the conservation status of the black-backed woodpecker in California, the species' sensitivity to some post-fire forest management actions, and the lack of synthesized information from California for this species, spurred the development of this Conservation Strategy." The Conservation Strategy is not a legally binding, agency policy or a regulatory document; moreover it was not designed to constrain the Forest Service in its actions and activities. Its' purpose is to summarize known information about the species, recommends management approaches for conservation, and suggests future research priorities (Bond et al. 2012).

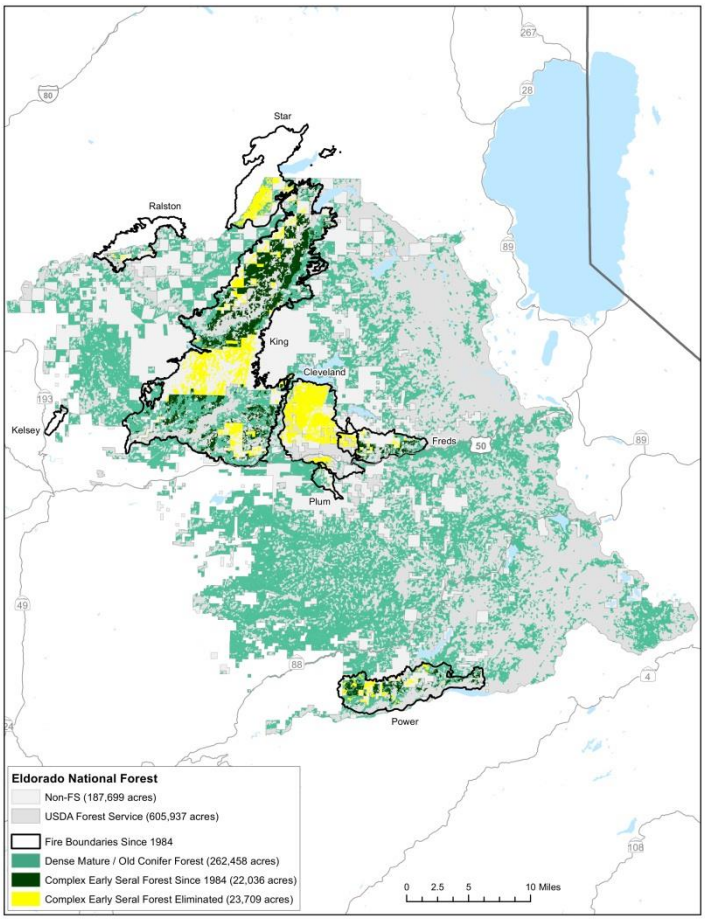
Approximately 181,000 acres of the project area have been identified as potential black-backed woodpecker habitat based on modeling, as described on page 325 of the FEIS. Of this almost 4,000 acres are within proposed treatment areas. The requested LOP would eliminate the ability to perform tree removal for salvage or hazard tree from May 1st through July 31st within these areas. The months of May thru October are typically the standard operating season for timber harvest and associated activities in this area, as between October and May winter weather can limit or preclude harvest operations. If operations were further limited during the period of May

to August, beyond the LOPs already identified in the Forest Plan, the ability to accomplish salvage of commercial material would be severely limited on this project and salvage of the mechanical units in the King Fire Restoration Project is highly unlikely to be completed next season. This would limit the ability to accomplish elements of the proposed project and therefore the ability to meet the purpose and need to remove dead trees in strategic fire management areas to improve the agency's ability to manage and control future fires and to actively manage severely burned areas to facilitate restoration and resilience.

As described in the economic analysis (Chapter 3 of the EIS), deterioration of wood is expected to limit the commercial value of the products removed as the time from the fire increases. After approximately 2 years following the fire most of the trees are expected to lose commercial value. With no commercial value to support the removal of trees, it would require additional supplemental funds to accomplish the removal of these trees to avoid heavy fuel loadings in the future or work would not be accomplished. Not accomplishing this work would result in high fuel accumulations within strategic areas and would preclude reforestation and reestablishment of conifer stands in these areas. LOPs on these areas would also make neighboring areas more expensive to treat, since additional move in and move out costs are incurred by operators when areas can only be treated during a specific time period and when treatment areas are spread farther apart. The prioritization of funds to accomplish this work and a loss in revenue would further limit the ability to accomplish other elements of the proposed project, which also limit the ability to meet the purpose and need to remove dead trees in strategic fire management areas to improve the agency's ability to manage and control future fires, to expeditiously recover timber killed by the fire commensurate with available markets for the purpose of generating funds to offset the cost of restoration activities, and to actively manage severely burned areas to facilitate restoration and resilience.

Ecology and Restoration

107. Comment (Commenter 11): The DEIS misrepresents the scientific literature as to what ecological resilience means. In vegetation types with mixed- and high-severity fire regimes, such as the mixed-conifer forests of the Sierra Nevada, natural diversity and heterogeneity of successional stages **from fire** is essential to maintaining the full complement of native biodiversity and fosters ecological resilience and integrity in montane forests (E.g., Hutto, 1995, 2008; Swanson et al., 2011; Bond et al., 2012; Williams and Baker, 2012a; DellaSala et al., 2014). Ecological resilience pertains to a dynamic equilibrium and is essentially the opposite of "engineering resilience," which pertains to the suppression of natural disturbance to achieve stasis, control of resources, and maximize growth and production of commodities, such as timber (Thompson et al. 2009). When the DEIS describes "resilience", it is describing engineering resilience, but misleadingly implies that it is describing ecological resilience. The DEIS promotes the concept of post-fire logging fuel reduction zones, which the DEIS repeatedly claims is needed ostensibly to prevent a future high-severity fire. Aside from the fact that post-fire logging and tree planting do not effectively reduce future fire intensity and high-severity areas tend to reburn at low/moderate-severity if they are not post-fire logged (as discussed below), why is it so important to further reduce/prevent this habitat, and artificially cut short the duration that complex early seral forest (CESF) remains on the landscape? These areas in the King fire are remote, nowhere near towns, and CESF is far rarer on the Eldorado National Forest than unburned dense mature/old forest is, even after including the King fire (see map below).



CESF is, in fact, the rarest, most biodiverse, and most threatened forest habitat type on the Eldorado National Forest and the Sierra Nevada (see map above; see also DellaSala et al. 2014).

Response: Resilience as defined by the Society for Ecological Restoration "is the ability of an ecosystem to regain structural and functional attributes that have suffered harm from stress or disturbance." Chapter 1 of the King Fire Restoration Project EIS describes how the term "resilience" is used in the context of the objectives for the Project. The proposal aims to "Actively manage severely burned areas to facilitate restoration and resilience." Prior to the King Fire, over 90% of the landscape had significant fire exclusion meaning that no substantial fires had burned within the area in the past century (FEIS Appendix A, pg. 9) altering the structure of the mixed conifer forests. As a result, a large portion of this landscape was not capable of regaining proper function and structure particularly when affected by a fast moving high intensity human ignited fire such as the King Fire which burned under unprecedented but lately uncommon conditions.

Early seral habitat is a successional stage that is initiated after stand replacing events. Recently burned forests can have dense patches of snags, abundant downed logs, montane chaparral patches and highly variable natural conifer regeneration (Swanson et al. 2010). Snags are created whenever a live tree dies from a mortality agent such as insects, disease or physical injury, including wind throw and fire. These components provide critical structures necessary to benefit many early seral species (Swanson et al. 2010, Collins and Roller 2013, White et al. 2013). However, early seral post-fire habitats are just one component of a complex temporal landscape. Recent research has documented the importance of within and between stand

heterogeneity that represents all seral stages and maximizes the presence of numerous species (White et al. 2013). Late successional habitats dominated by conifer trees are also an important successional stage. This seral stage evolved with low to moderate intensity fire and has a limited capacity to recover after stand replacing events due to limited natural regeneration and extensive shrub cover (Collins and Roller 2013). As a result, once conifer forests may be converting to new vegetation assemblages following high severity fire (Perry et al. 2011). The response from DellaSalla et al. (2013) to Franklin and Johnson (2012) provides guidance on the maintenance of early seral conditions in the Pacific Northwest and it is recognized that these principles certainly help to guide management of complex early seral forests in the Sierra Nevada.

Early seral conditions are important, but not rare in the Sierra Nevada landscape. Assessment of shrub cover in the Sierra Nevada landscapes suggest that the overall portion of the yellow pine mixed conifer landscape occupied by shrubs today is broadly similar to, but possibly lower than the portion occupied at the beginning of the 20th century (Safford 2013). Historical accounts from Leiberg (1902) reported that chaparral covered only 5.7 percent of the area mapped (large portions of the Plumas and Tahoe NFs, and very small pieces of the Lassen, Eldorado and Lake Tahoe Basin MU). Additionally, based upon early 20th century forest surveys (i.e. the 1910-1912 Stanislaus timber survey cited by Center for Biological Diversity/John Muir Project) Show and Kotok (1924) estimated that chaparral covered only 1 percent of six National Forests (Lassen, Plumas, Tahoe, Eldorado, Stanislaus, and Sierra; Table 19, pg. 41) in the Sierra Nevada at the beginning of the 20th century. Modelling the historic presence of early seral conditions on a landscape that was characterized by 7 percent high severity fire showed that 20% would have been in the early successional stage (Miller, personal communication). Historic reports and models do not indicate that early seral conditions are rare in current conditions.

In fact, under the current and predicted climate scenarios early seral conditions will continue to increase on the landscape (Lenihan et al. 2008, Cole 2010). Miller et al. (2009) and Miller and Safford (2012) found "broad-scale, quantitative demonstration that the extent of forest stand replacing fire is increasing across a significant part of the western US." This increase is driven by greatly homogenized forests with higher canopy cover and dense trees that have the ability to burn in stand replacing events transitioning them to early seral conditions. Mallek et al. (2013) found that current rates of high severity fire in yellow pine and mixed conifer forests, which constituted much of the Rim Fire area on the Stanislaus NF, are similar to probable presettlement rates of high severity fire. In other words, in these forest types there does not seem to be a deficit of early seral habitat caused by fire. Future model predictions suggest increased transition of forest to chaparral and grassland being driven by increased fire activity (Lenihan et al. 2008).

The 2004 FEIS ROD provides management guidelines for disturbance events such as wildfires including recovering the economic value of timber killed or injured by the "disturbance" (wildfire), re-establishing forested conditions and managing the development of fuel profiles over time. These guidelines include the recommendation to "…generally …not conduct salvage harvest in at least 10 percent of the total area affected by fire." (USDA 2004, pg. 52). The FEIS recognizes the importance of the CESF. "Maintaining multi-structure early-seral conditions is important across the King Fire area for: 1) supporting wildlife that require post-fire snags and shrubs, 2) breaking up the continuity of adjacent seral stages, and 3) allowing natural succession to proceed: (FEIS, Appendix A, p. 11). All alternatives propose to maintain 14-17% of CESF (FEIS, Appendix A, p. 10).

Early seral habitat is discussed on pages 107 to 108 of the FEIS. "Alternative 1 retains the most early-seral but exceeded the calculated NRV (25% Existing, 15-20% NRV) (Table 3EC.8). The remaining four alternatives range from 14-17 percent and all fall closely within the NRV

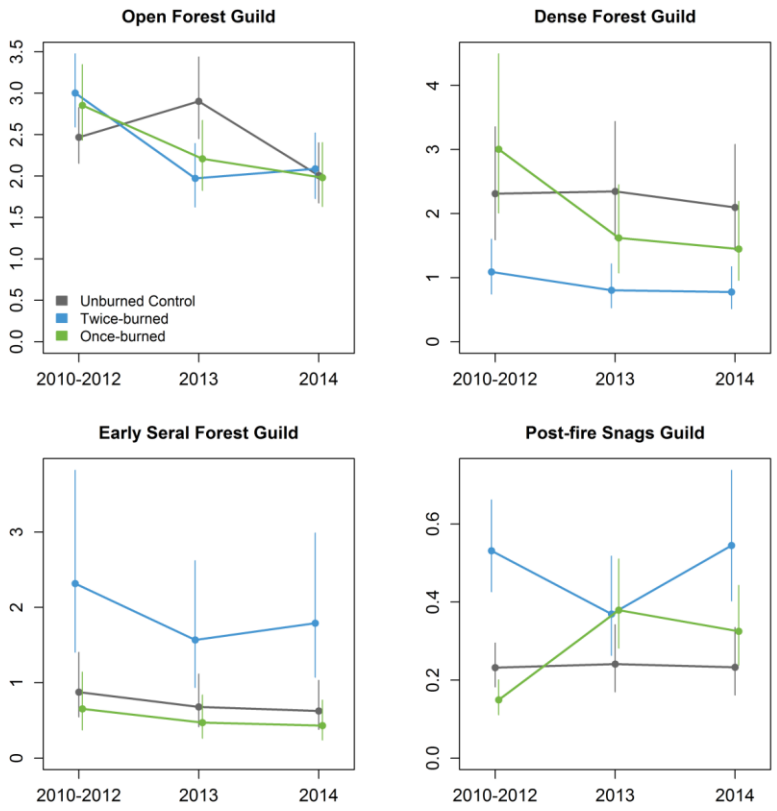
maintaining sufficient area in an early-seral condition. The addition of other early-seral conditions (single-structure, variable density) would likely maintain more early-seral habitats across a gradient across the King Fire area that would provide important features for a number of dependent species."

Perry, D., P. F. Hessburg, C. N. Skinner, T. A. Spies, S. Scott, A. H. Taylor, J. F. Franklin, B. McComb, and G. Riegel. 2011. The ecology of mixed fire severity regimes in Washington, Oregon, and Northern California. Forest Ecology and Management 262:703-717.

White AM, Zipkin EF, Manley PN, Schlesinger MD (2013) Conservation of Avian Diversity in the Sierra Nevada: Moving beyond a Single-Species Management Focus. PLoS ONE 8(5): e63088. doi:10.1371/journal.pone.0063088

108. Comment (Commenter 11): The DEIS misrepresents the science by repeatedly raising the specter of high-severity fire "reburn" (high-severity fire areas that reburn at high-severity some years later), as if this would be some sort of ecological disaster. But that is simply untrue and based on false assumptions. In fact, when high-severity fire areas reburn in conifer forests, the result is highly biodiverse and species-rich CESF that supports some of the greatest levels of plant and wildlife diversity and abundance found in any forest habitat type—even compared to unburned old forest (Donato et al. 2009, Fontaine et al. 2009, Campos and Burnett 2015). For example, this was the result when some of the high-severity fire areas in the Storrie fire of 2000 reburned at high-severity in the Chips fire of 2012, and the rarest and most underrepresented guilds of bird species benefitted tremendously, while the dense forest bird species, which are most abundant and have by far the most habitat in the Sierra Nevada, declined in reburn areas. Below is figure 3 from Campos and Burnett (2015) ("Avian Monitoring of the Storrie and Chips Fire Areas"), Point Blue Conservation:

The change in the total summed abundance of bird species in each of four habitat guilds (y-axis), before and after the 2012 Chips Fire (x-axis) in areas that were previously burned in the Storrie Fire in 2000 (twice-burned) and those first burned in Chips (once-burned) compared to unburned controls in the adjacent landscape. Vertical lines represent 95% confidence intervals around mean estimates.



Response: Future reburns may have beneficial or detrimental effects on wildlife habitat and species depending on frequency, intensity and scale recognizing that some reburning does support some heterogeneity (Roberts et al. 2015, Lydersen and North 2012, Fontaine et al. 2009). Typically, areas that reburn are highly dependent on the severity of the previous fire; therefore, areas that burn at high severity tend to reburn at high severity (Thompson and Spies 2010, Lyderson et al. 2014). This has been the case in many recent fires such as the Chips fire which reburned portions of the Storrie fire. Not surprising early seral stand conditions dominated by standing snags and resprouting shrubs and oaks burned at high severity. Not surprising areas that remained in seral conditions as the result of a second high severity fire had increases in early seral forest guild avian species and post-fire snag guilds (Campos and Burnett 2015). This likely occurred because of the quick ability of the vegetation to sprout back and support early seral guilds quicker than the adjacent unburned or once burned forest (Fontaine et al. 2009, Campos and Burnett 2015).

Approximately, 14-17% of the landscape will be maintained in multi-structure early seral forest. This amounts to about 13,000 – 16,000 acres across the King fire landscape (FEIS Appendix A, pg. 15). These areas will be available for reburn in any future fires and could potentially support a wide variety of avian species. Additionally, 2,841 acres are being proposed within the high severity King Fire areas for prescribed fire (FEIS pg. 14). These areas in a 5-7 year timeframe would be reburned and reset to early seral conditions and hypothetically would continue to support early seral forest avian species.

109. Comment (Commenter 11): Ecological resilience embraces natural disturbance processes, including intense fire, that create important habitat heterogeneity at the landscape scale, and embraces circumstances in which underrepresented natural early successional habitats (CESF, not

clearcuts and tree plantations) persist for variable periods of time—including longer periods—before ultimately becoming forest again (Thompson et al. 2009, Donato et al. 2012). Moreover, and perhaps most importantly, ecological resilience is fundamentally about maintaining and optimizing native biodiversity, so actions which remove rare and biodiverse habitats upon which rare and declining wildlife species depend are undermining ecological resilience (Thompson et al. 2009, p. 43), and that is precisely what the post-fire logging "fuel" reduction zones would do—undermine and destroy ecological resilience, not foster it.

Response: The 2004 FEIS ROD provides management guidelines for disturbance events such as wildfiresincluding recovering the economic value of timber killed or injured by the "disturbance" (wildfire), re-establishing forested conditions and managing the development of fuel profiles over time. These guidelines include the recommendation to "…generally …not conduct salvage harvest in at least 10 percent of the total area affected by fire." (USDA 2004, pg. 52). The FEIS recognizes the importance of the CESF. "Maintaining multi-structure early-seral conditions is important across the King Fire area for: 1) supporting wildlife that require post-fire snags and shrubs, 2) breaking up the continuity of adjacent seral stages, and 3) allowing natural succession to proceed: (FEIS, Appendix A, p. 11). All alternatives propose to maintain 14-17 percent of CESF (FEIS, Appendix A, p. 10).

Early seral habitat is discussed on pages 107 to 108 of the FEIS. "Alternative 1 retains the most early-seral but exceeded the calculated NRV (25% Existing, 15-20% NRV) (Table 3EC.8). The remaining four alternatives range from 14-17 percent and all fall closely within the NRV maintaining sufficient area in an early-seral condition. The addition of other early-seral conditions (single-structure, variable density) would likely maintain more early-seral habitats across a gradient across the King Fire area that would provide important features for a number of dependent species.

110. Comment (Commenter 11): The DEIS does not adequately analyze the impacts, cumulative effects, and highly uncertain and unknown risks of logging a large percentage (about half) of the rarest forest habitat type on the entire Eldorado National Forest: complex early seral forest (CESF), resulting from high-intensity fire (75-100% mortality, as determined by www.mtbs.gov fire severity categories) occurring in dense, mature/old conifer forest (CWHR 4M, 4D, 5M, 5D, and 6) that has not been subjected to post-fire logging. CESF is the most biodiverse and wildlife-rich forest habitat type (see our scoping comments and attachments on this), yet due to fire suppression, post-fire logging, and post-fire shrub eradication (through chemical and mechanical means) and tree plantation establishment, it now comprises only a tiny percentage of the Eldorado National Forest, even after including the King fire, as we discussed in our scoping comments (including the attached CESF map). This is especially true in light of the findings of Hanson (2014)—i.e., that a large proportion of forest bird species associated with CESF are declining in the Sierra Nevada whereas no such pattern is evident for birds associated with unburned/low-severity fire areas.

Response: We make no argument against the commenter's statements as to the value of early seral habitats and burned forest. The agency has for years argued for the value of non-coniferous vegetation on the landscape, and have long built into proposed actions objectives to restore understory vegetation and to promote non-coniferous plants on the landscape. As described in the FEIS, pg. 5, one of the purposes of the project (Purpose and Need #4) is to: "Balance active management with the retention of important attributes of post-fire habitat at the landscape scale and within treatment areas to support the diversity and abundance of species", specifically recognizing that "complex early-seral forest with snags and naturally recovering

understory vegetation created by moderate- and high-severity fire are a valuable habitat stage that supports important ecological processes and a diversity of species".

A discussion of complex early-seral habitat is included in the Environmental Consequences – *Terrestrial Wildlife* section in the FEIS on pgs. 283 to 292. Table 3W-T.3 (FEIS, pg. 287) outlines the acres of treatment within complex early-seral habitats (CWHR size class 4 or 5 and density class M or D with greater than 75% basal area mortality), including cumulative salvage acres. Of the 19,298 acres of complex early-seral habitats on NFS lands, salvage treatments would affect 29 to 35 percent of complex early-seral habitat on NFS lands. Cumulatively, of the 28,277 acres of complex early-seral habitat on NFS and private lands, 52 to 57 percent may be affected by salvage treatments.

111. Comment (Commenter 11): High-intensity fire patches, including large patches, in large fires are natural in Sierra Nevada mixed-conifer forests, and create very biodiverse, ecologically important, and unique habitat (often called "snag forest habitat"), which often has higher species richness and diversity than unburned old forest. Natural conifer forest regeneration occurs following high-intensity fire. Miller et al. (2012b) found that the current high-intensity fire rotation in Sierra Nevada montane conifer forests is 801 years; thus, within any 20-year period, for instance, only about 2.5% of the landscape is snag forest habitat ***even if*** none of it is subjected to post-fire salvage logging and artificial replanting. In contrast, the old-growth stands dominated by the largest trees, and multi-level canopy cover, CWHR class 6, comprise 1,120,000 acres—more than 10% of the forested area in the Sierra Nevada (2001 Sierra Nevada Forest Plan Amendment Final EIS, Table 4.4.2.1f). Historical mixed-conifer forests were frequently dominated by white fir and incense-cedar, and often had dense understories.

Baker, W.L. 2014. Historical forest structure and fire in Sierran mixed-conifer forests reconstructed from General Land Office survey data. Ecosphere 5: Article 79. ***(Using an enormous U.S. government field survey data set from the 1800s, it was determined that historical ponderosa pine and mixed-conifer forests of the Sierra Nevada were much denser than previously assumed, and were dominated by mixed-intensity fire, while 13-26% were open forests with low-intensity fire. These forests were highly variable in species composition too, historically, with many areas dominated by fir/cedar forests, and others dominated by pine, but with substantial fir/cedar components. High-intensity fire comprised 31-39% of fire effects historically, and high-intensity fire patches hundreds of acres in size were common, with some high-intensity fire patches reaching over 20,000 acres in size. High-intensity fire in historical forests occurred on average about every three centuries, which is much more frequent than the rate of high-intensity fire in these forests currently. Moreover, high-intensity fires occurred, in any given area, about once every 281-354 years—much more frequently than current rates).***

Bekker, M. F. and Taylor, A. H. 2010. Fire disturbance, forest structure, and stand dynamics in montane forest of the southern Cascades, Thousand Lakes Wilderness, California, USA. Ecoscience 17: 59-72. ***(In mixed-conifer forests of the southern Cascades in the Sierra Nevada management region, reconstructed fire severity within the study area was dominated by high-severity fire effects, including high-severity fire patches over 2,000 acres in size [Tables I and II]).***

Buchalski, M.R., J.B. Fontaine, P.A. Heady III, J.P. Hayes, and W.F. Frick. 2013. Bat response to differing fire severity in mixed-conifer forest, California, USA. PLOS ONE 8: e57884. ***(In mixed-conifer forests of the southern Sierra Nevada, rare myotis bats were found at greater levels in unmanaged high-severity fire areas of the McNally fire than in***

lower fire severity areas or unburned forest.)

Burnett, R.D., P. Taillie, and N. Seavy. 2010. Plumas Lassen Study 2009 Annual Report. U.S. Forest Service, Pacific Southwest Region, Vallejo, CA. ***(Bird species richness was approximately the same between high-severity fire areas and unburned mature/old forest at 8 years post-fire in the Storrie fire, and total bird abundance was greatest in the high-severity fire areas of the Storrie fire [Figure 4]. Nest density of cavity-nesting species increased with higher proportions of high-severity fire, and was highest at 100% [Figure 8]. The authors noted that "[o]nce the amount of the plot that was high severity was over 60% the density of cavity nests increased substantially", and concluded that "more total species were detected in the Moonlight fire which covers a much smaller geographic area and had far fewer sampling locations than the [unburned] green forest.")***

Cocking MI, Varner JM, Knapp EE. 2014. Long-term effects of fire severity on oak-conifer dynamics in the southern Cascades. Ecological Applications 24: 94-107. ***(High-intensity fire areas are vitally important to maintain and restore black oaks in mixed-conifer forests.)***

Crotteau JS, Varner JM, Ritchie M. 2013. Post-fire regeneration across a fire severity gradient in the southern Cascades. Forest Ecology and Management 287: 103-112. ***(The authors found 710 conifer seedlings/saplings per hectare naturally regenerating in large high-severity fire patches. And, while Collins and Roller (2013) reported relatively little natural conifer regeneration in many high-severity fire areas, this is misleading in light of the fact that nearly half of the area surveyed had been subjected to intensive post-fire logging, which damages soils and removes or destroys natural seed sources, and most of the other areas had been clearcut prior to the fires (which we discovered using pre-fire remote sensing data), or were naturally non-conifer forest, e.g., black oak. The results of Collins et al. (2010 [Table 5]), who found and reported substantial natural conifer regeneration—especially ponderosa/Jeffrey pine and sugar pine—in high-intensity fire patches, excluded salvage logged areas, unlike Collins and Roller (2013). Collins et al. (2010) state that "some areas within each of these fires experienced post-fire management, ranging from post fire salvage logging, tree release and weed management. These areas were removed from analysis." (emphasis added). Specifically, Collins et al. (2010 [Table 5]) found 158 ponderosa pine and sugar pine conifers per acre regenerating in high-intensity fire patches in the Storrie fire—68% of the total natural conifer regeneration by species. Extensive natural conifer regeneration surveys deeper into the Storrie fire, at seven years post-fire, revealed abundant natural conifer regeneration, especially pine (Hanson 2007b [Tables 1 through 4, and Appendix A]). In addition, over 95% of the conifer regeneration in Collins et al. (2010) and Collins and Roller (2013) was under 0.1 cm in diameter at breast height (Collins et al. 2010); the plots used to determine the density of conifers of this size covered only 9 square meters of area per plot, and many high-intensity fire patches in the study only had 3-5 plots for an entire high-intensity fire patch (Collins and Roller 2013). This means that, even if 200-300 naturally-regenerating conifers per hectare actually existed in a given high-intensity fire patch, the methods used by Collins and Roller (2013) would be very unlikely to detect conifers, as a matter of basic math and probability.)***

DellaSala, D.A., M.L. Bond, C.T. Hanson, R.L. Hutto, and D.C. Odion. 2014. Complex early seral forests of the Sierra Nevada: what are they and how can they be managed for

ecological integrity? Natural Areas Journal 34: 310-324. ***(High-intensity fire creates a post-fire habitat that is one of the rarest, most biodiverse, and most threatened of all forest habitat types: "complex early seral forest" (CESF). The authors recommend monitoring and conservation programs to recover and maintain this ecologically-vital habitat on the landscape.)***

Donato, D.C., J.B. Fontaine, W.D. Robinson, J.B. Kauffman, and B.E. Law. 2009. Vegetation response to a short interval between high-severity wildfires in a mixed-evergreen forest. Journal of Ecology 97: 142-154. ***(The high-severity re-burn [high-severity fire occurring 15 years after a previous high-severity fire] had the highest plant species richness and total plant cover, relative to high-severity fire alone [no re-burn] and unburned mature/old forest; and the high-severity fire re-burn area had over 1,000 seedlings/saplings per hectare of natural conifer regeneration.)***

Hanson, C.T. 2014. Conservation concerns for Sierra Nevada birds associated with high-severity fire. Western Birds 45: 204-212. ***(A significantly greater proportion of forest birds associated with the habitat created by high-severity fire are experiencing population declines relative to forest birds associated with unburned forest in the Sierra Nevada.)***

Hanson, C.T., and D.C. Odion. Historical forest conditions within the range of the Pacific Fisher and Spotted Owl in the central and southern Sierra Nevada, California, USA. Natural Areas Journal (in press). ***(Based upon early 20th century U.S. Forest Service field surveys, historical ponderosa pine and mixed-conifer forests of the western slope of the central and southern Sierra Nevada had a mixed-intensity fire regime, averaging 26% high-intensity fire effects in the study areas—and ranging from none in one location to 67% in another. Forests varied widely in terms of density and species composition, with some open, pine-dominated forests and many dense, pine and fir/cedar-dominated areas. Moreover, the high-intensity fire rotation interval was 222 years—much more frequent than current rates of about 800 years.)***

Hodge, W.C. 1906. Forest conditions in the Sierras, 1906. U.S. Forest Service. Eldorado National Forest, Supervisor's Office, Placerville, CA. ***(Historically in mixed-conifer and ponderosa pine forests of the western Sierra Nevada, density ranged generally from about 100 to 1000 trees per acre, and stands were often comprised mostly of white fir and incense-cedar, and were dominated by smaller trees.) (This report constitutes new information under NEPA because it was not re-discovered until recently).***

Miller, J.D., B.M. Collins, J.A. Lutz, S.L. Stephens, J.W. van Wagtendonk, and D.A. Yasuda. 2012b. Differences in wildfires among ecoregions and land management agencies in the Sierra Nevada region, California, USA. Ecosphere 3: Article 80. ***(Current high-severity fire rotation interval in the Sierra Nevada management region overall is over 800 years. The authors recommended increasing high-severity fire amounts [i.e., decreasing rotation intervals] in the Cascades-Modoc region and on the western slope of the Sierra Nevada (which together comprise most of the forest in the Sierra Nevada management region), where the current high-severity fire rotation is 859 to 4650 years [Table 3]. The authors noted that "high-severity rotations may be too long in most Cascade-Modoc and westside NF locations, especially in comparison to Yosemite…" These areas, in which the authors concluded that there is far too little high-severity fire, comprise 75% of the forests in the Sierra Nevada management region [Table 3].)***

Nagel, T.A. and Taylor, A.H. 2005. Fire and persistence of montane chaparral in mixed conifer forest landscapes in the northern Sierra Nevada, Lake Tahoe Basin, California, USA. J. Torrey Bot. Soc.132: 442-457. ***(The authors found that large high-severity fire patches were a natural part of 19th century fire regimes in mixed-conifer and eastside pine forests of the Lake Tahoe Basin, and montane chaparral created by high-severity fire has declined by 62% since the 19th century due to reduced high-severity fire occurrence. The authors expressed concern about harm to biodiversity due to loss of ecologically rich montane chaparral.)***

Odion D.C., Hanson C.T., Arsenault A., Baker W.L., DellaSala D.A., Hutto R.L., Klenner W., Moritz M.A., Sherriff R.L., Veblen T.T., Williams M.A. 2014. Examining historical and current mixed-severity fire regimes in ponderosa pine and mixed-conifer forests of western North America. PLoS ONE 9: e87852. ***(In the largest and most comprehensive analysis ever conducted regarding the historical occurrence of high-intensity fire, the authors found that ponderosa pine and mixed-conifer forests in every region of western North America had mixed-intensity fire regimes, which included substantial occurrence of high-intensity fire. The authors also found, using multiple lines of evidence, including over a hundred historical sources and fire history reconstructions, and an extensive forest age-class analysis, that we now have unnaturally low levels of high-intensity fire in these forest types in all regions, since the beginning of fire suppression policies in the early 20th century.)***

Powers, E.M., J.D. Marshall, J. Zhang, and L. Wei. 2013. Post-fire management regimes affect carbon sequestration and storage in a Sierra Nevada mixed conifer forest. Forest Ecology and Management 291: 268-277. ***(In Sierra Nevada mixed conifer forests, the highest total aboveground carbon storage was found to occur in mature/old forest that experienced 100% tree mortality in wildland fire, and was not salvage logged or artificially replanted, relative to lightly burned old forest and salvage logged areas [Fig. 1b]).***

Shatford, J.P.A., D.E. Hibbs, and K.J. Puettmann. 2007. Conifer regeneration after forest fire in the Klamath-Siskiyous: how much, how soon? Journal of Forestry April/May 2007, pp. 139-146.

Siegel, R.B., M.W. Tingley, and R.L. Wilkerson. 2011. Black-backed Woodpecker MIS surveys on Sierra Nevada national forests: 2010 Annual Report. A report in fulfillment of U.S. Forest Service Agreement No. 08-CS-11052005-201, Modification #2; U.S. Forest Service Pacific Southwest Region, Vallejo, CA. ***("Many more species occur at high burn severity sites starting several years post-fire, however, and these include the majority of ground and shrub nesters as well as many cavity nesters. Secondary cavity nesters, such as swallows, bluebirds, and wrens, are particularly associated with severe burns, but only after nest cavities have been created, presumably by the pioneering cavity excavating species such as the Black-backed Woodpecker. Consequently, fires that create preferred conditions for Black-backed Woodpeckers in the early post-fire years will likely result in increased nesting sites for secondary cavity nesters in successive years.")***

Swanson, M.E., J.F. Franklin, R.L. Beschta, C.M. Crisafulli, D.A. DellaSala, R.L. Hutto, D. Lindenmayer, and F.J. Swanson. 2010. The forgotten stage of forest succession: early-successional ecosystems on forest sites. Frontiers Ecology & Environment 2010; doi:10.1890/090157. ***(A literature review concluding that some of the highest levels of***

native biodiversity found in temperate conifer forest types occur in complex early successional habitat created by stand-initiating [high severity] fire.)

USFS (United States Forest Service). 1910-1912. Timber Survey Field Notes, 1910-1912, U.S. Forest Service, Stanislaus National Forest. Record Number 095-93-045, National Archives and Records Administration—Pacific Region, San Bruno, California, USA. ***(Surveys were conducted within unlogged forest to evaluate timber production potential in 16.2-ha (40-acre) plots within each 259.1-ha (640-acre) section in ponderosa pine and mixed-conifer forest on the westside of the Stanislaus National Forest, using one or more 1.62-ha transect per plot. Surveyors noted that surveys for individual tree size, density and species were not conducted in areas that had experienced high-severity fire sufficiently recently such that the regenerating areas did not yet contain significant merchantable sawtimber. Surveyors noted that the dominant vegetation cover across the majority of many 259.1-ha sections was montane chaparral and young conifer regeneration following high-severity fire. For example (from a typical township in the data set): a) T1S, R18E, Section 9 ("Severe fire went through [this section] years ago and killed most of the trees and land was reverted to brush", noting "several large dense sapling stands" and noting that merchantable timber existed on only four of sixteen 16.2-ha plots in the section); b) T1S,R18E, Section 14 ("Fires have killed most of timber and most of section has reverted to brush"); c) T1S, R18E, Section 15 (same); d) T1S, R18E, Section 23 ("Most of timber on section has been killed by fires which occurred many years ago"); T1S, R18E, Section 21("Old fires killed most of timber on this section and most of area is now brushland". Moreover, with regard to understory density, the USFS 1911 Stanislaus data set (USFS 1910-1912) recorded average sapling density on 72 ponderosa pine forest sections (and some mixedconifer) (each section one square mile in size), with an average density of 102 saplings per acre (252 per hectare) in sections noted as having no previous logging. This is not consistent with the assumption of very low densities of saplings historically. In addition, the 1911 Stanislaus data set also recorded percent shrub cover on 57 sections (each one square mile) in ponderosa pine forests (and some mixed-conifer), with an average of 28% shrub cover in unlogged sections within forested areas with merchantable timber. In a total of 35 sections, surveyors recorded the proportion of the one-square-mile section comprised by montane chaparral areas (which often included natural conifer regeneration in the seedling, sapling, and/or pole-sized successional stage) with no merchantable timber. These montane chaparral areas represented 12,200 acres out of a total of 22,400 acres, or about 54%. As discussed above, in many of these montane chaparral areas, the visible signs of past high-severity fire were still evident, and surveyors specifically recorded large high-severity fire patches. The total area covered by the surveys was vastly larger than the small subset analyzed in Scholl and Taylor 2010 and Collins et al. 2011.) (This report constitutes new information under NEPA because it was not discovered/revealed until recently).***

Response: The response to comment 107 recognizes the importance of early seral habitat to support a diverse array of species assemblages. Under the current and predicted climate scenarios early seral conditions will continue to increase on the landscape (Lenihan et al. 2008, Cole 2010). Miller et al. (2009) and Miller and Safford (2012) found "broad-scale, quantitative demonstration that the extent of forest stand replacing fire is increasing across a significant part of the western US." This increase is driven by greatly homogenized forests with higher canopy cover and dense trees that have the ability to burn in stand replacing events transitioning them to early seral conditions. Future model predictions suggest increased transition of forest to chaparral and grassland being driven by increased fire activity (Lenihan et al. 2008).

Areas within the fire area have been identified for restoration based on a number of criteria to meet the purpose and need (FEIS pg. 9). These areas were selected on their ability to not regenerate after high severity fire based on the distance to nearest seed source (FEIS pg. 10). The alternatives select a range of estimates for seed dispersal from 100 - 600 meters from the edge of green forest.

112. Comment (Commenter 11): Only fire that burns severely creates significant enough ecological change to support a unique composition of species – not the mild understory fires. Many species of vertebrates, invertebrates, and plants have evolved to take advantage of severely burned forest habitat (Hutto 2006, 2008). Using birds as an example, the following studies have documented the ecological value of severely burned forests for a number of species in different regions of the western U.S.:

- Raphael et al. (1987) monitored breeding birds in three periods after the 1960 Donner Fire in the Eastern Sierra Nevada, allowing for long-term effects of severe fire to be examined (fire severity was not specifically quantified but it was noted that the burned plot contained high-severity burn). The authors found that total density of birds was nearly the same on the burned and unburned plots but species richness increased on the burned plot. Thirty-eight species bred on the burned plot while 32 bred on the unburned plot (25 bred on both plots). More breeding species were unique to the burned plot (13) than to the unburned plot (7).
- Smucker et al. (2005) examined effects of fire of different severities and ages on songbirds in point-count transects that had been set up 5 years prior as a part of the Northern Region Landbird Monitoring Program in forests in Montana. The authors found that of the 40 species with adequate sample size to include in statistical analyses, 4 increased significantly in relative abundance after fire and 5 decreased significantly after fire, independent of fire severity. However, placing point count stations into categories that correspond with whether they burned at low, moderate, or high severity, the authors discovered significant changes in relative abundance from before to after fire at one or more severities for an additional 9 species. The data revealed that 12 species were significantly more abundant and 7 species were significantly less abundant after fire at one or more severities. An additional 4 species (including Black-backed Woodpecker, House Wren, Western Wood Pewee, and Three-toed Woodpecker) were detected more frequently after fire, although sample sizes were too small to include in the statistical analysis. Thus, a total of 16 species responded positively to at least one level of fire severity, underscoring the importance of accounting for fire severity. With respect to time since fire, for both increasers and decreasers the magnitude of change in relative abundance between the first two years after fire was greater at points that burned at high or moderate severity than at points that were unburned or burned at low intensity. This suggests that high and moderate severity fire (in contrast to low-severity fire) creates a unique and important habitat type for many bird species.
- Kotliar et al. (2007) published a similar study comparing bird densities before and after fire and in varying burn severities in New Mexico. Western Bluebirds were uncommon in all but the highest burn-severity level and Hairy Woodpeckers and House Wrens increased with increasing burn severity. The authors were able to analyze pre- and post-fire density patterns for 15 species, and 4 of the species showed significant burn-severity effects. Mourning Doves had higher densities across all burn severities, American Robins increased significantly after fire in high-severity patches and in comparison with pre-fire densities, and post-fire densities of Broad-tailed Hummingbirds and Western Bluebirds increased with increasing burn severity and were significantly greater in high-severity patches compared to unburned. Furthermore, the pre- and post-fire community was similar in all except high-

severity areas. Like results from Smucker et al. (2005) in Montana, this means that forests after high-severity fire support a unique community of bird species.

Response: The Forest Service makes no argument against the commenter's statements as to the value of early seral habitats and burned forest. The removal of fire-killed trees reduces nesting and foraging structures provided by snags, and decreases their presence as biological legacies and future down woody material in the various seral stages of developing forest habitats (FEIS pg. 284). The removal of snags and reforestation reduce both the complexity and amount of early-seral habitat and the time that shrub-dominated habitats persist on the landscape (FEIS pg. 290).

The agency has for years argued FOR the value of non-coniferous vegetation on the landscape, and have long built into proposed actions objectives to restore understory vegetation and to promote non-coniferous plants on the landscape.

Early seral habitat is discussed in the FEIS on pages 107 to 108. "Alternative 1 retains the most early-seral but exceeded the calculated NRV (25% Existing, 15-20% NRV) (Table 3EC.8). The remaining four alternatives range from 14-17 percent and all fall closely within the NRV maintaining sufficient area in an early-seral condition.

The addition of other early-seral conditions (single-structure, variable density) would likely maintain more early-seral habitats across a gradient across the King Fire area that would provide important features for a number of dependent species. The amounts of multi-structure early-seral conifer forest maintained in the various alternatives range from 35-41 percent of the high-severity conifer/mixed hardwood conifer patches. Single-structure early-seral conifer forest will help to provide potential habitat for naturally regenerating vegetation and range from 4-6 percent across alternatives. The remaining early-seral conifer condition would reintroduce conifers in a variable structure that would mimic natural regeneration spatial patterns. This approach would likely retain some percentage of shrub regrowth even outside of the snag retention patches. The amount of area retained ranges from 26-31 percent across the alternatives, which would be outside NRV (8.6-11.1%) (FEIS pg. 107).

The delineation of retention patches that are ten percent of each treatment unit would be retained in 0.25 acre to 5-acre patches generally comprised of the largest densest trees, and favoring patches larger than 2 acres in size as recommended by Point Blue Conservation Science from results of avian monitoring in post-fire habitats. Snags remaining in riparian buffers of 10 to 100 feet (depending on stream type and location) will also contribute to snag habitat important to a variety of wildlife (FEIS pg. 289).

Fire and Fuels

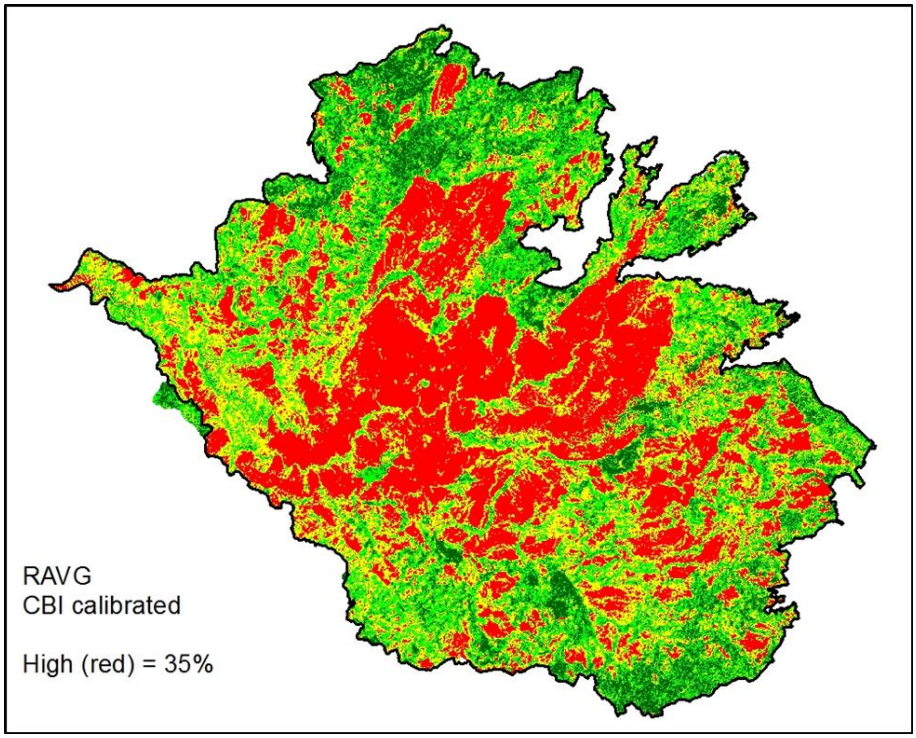
113. Comment (Commenter 11): The DEIS mischaracterizes fire severity when assessing spotted owls and impacts from the fire and logging, by relying upon the Forest Service's preliminary RAVG fire severity system, which does not account for flushing of ponderosa pines at one year post-fire (or new green leaves on black oaks), and therefore greatly overstates the amount of high-severity fire (see attached photo groups showing flushing of pines in the areas currently mapped as high-severity—we found this flushing to be pervasive in these areas; see also attached comparison between RAVG 75-100% mortality preliminary mapping and MTBS final mapping of 75-100% mortality areas in the Rim fire: 40% versus 20% high-severity fire from preliminary to final). The DEIS must take this into account, and it is arbitrary not to given the differences on the landscape that will occur over time as compared to the RAVG assessment.

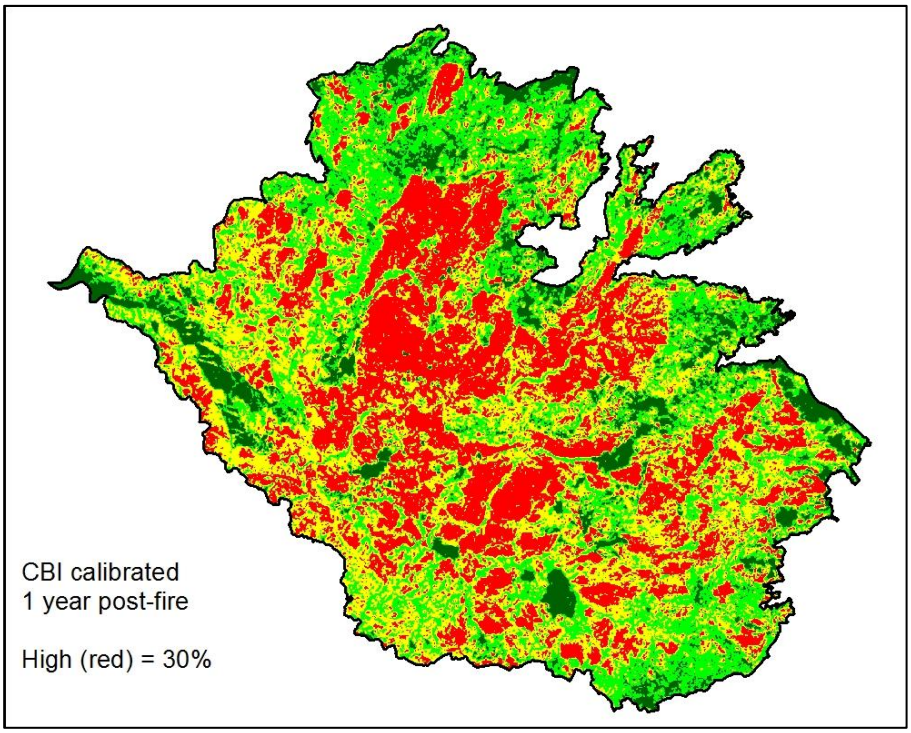
Response: The RAVG map is produced a few weeks after the fire and compares the change in vegetation before the fire and immediately after the fire. The RAVG process produces several different classifications of vegetative burn severity: Basal Area Loss (four and seven categories), Composite Burn Index (four categories), and Canopy Mortality (five categories).

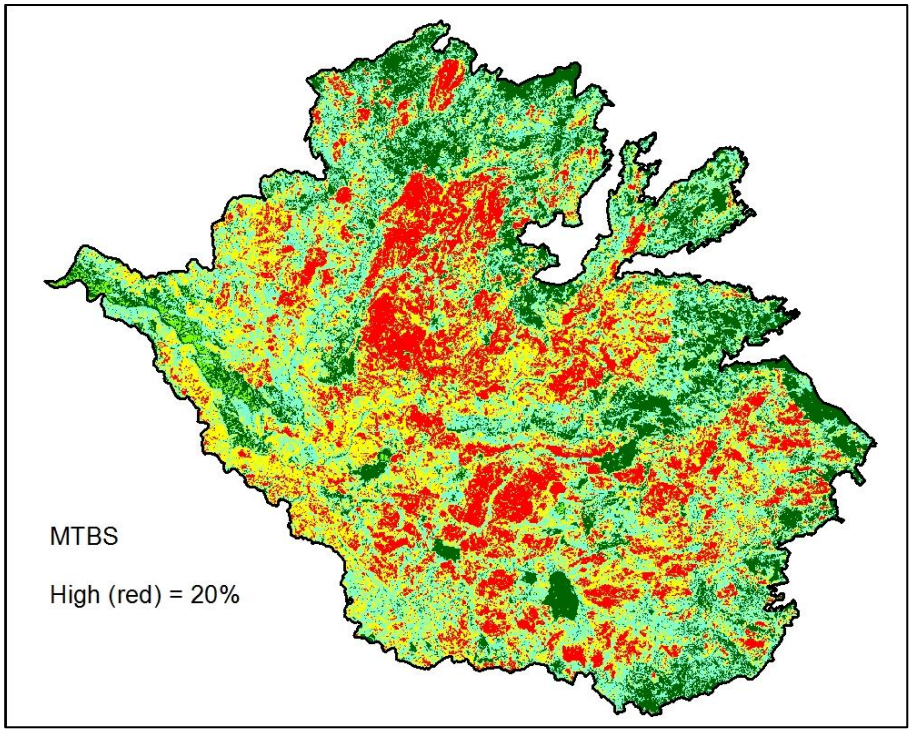
The MTBS map compares vegetation before the fire with vegetation some months afterward and uses a five category classification scheme. Since the MTBS image uses a later post fire image, it may reflect some regrowth of vegetation after the fire. Re-sprouting of grasses and shrubs under a burned canopy could lessen the apparent burn severity in the MTBS image as compared to the RAVG image. Also, since the MTBS definitions of "High, Moderate, and Low Severity" are not the same as the classifications in the RAVG products, direct comparisons of the two are difficult to make.

There are fundamental differences in the mapping methodologies employed by the RAVG and MTBS programs. First, the two programs use two difference satellite indices for producing maps. MTBS uses the differenced normalized burn ratio (dNBR) while RAVG uses a relativized dnbr (RdNBR). The most significant characteristic of dNBR data is that they are correlated to the amount of pre-fire chlorophyll where as RdNBR is not (Miller and Thode 2007). Thus, dNBR values do not always represent the same percent mortality detected by changes in chlorophyll because of differences in species and amounts of vegetative cover within and between fires. Each dNBR image must therefore be individually interpreted. The fact that the dNBR image is correlated to the amount of live pre-fire chlorophyll can therefore be a disadvantage when deriving categorical maps (e.g. low, medium moderate, and high categories) that represent consistent ranges of percent mortality (Safford et al. 2008). Second, although general image interpretation rules are followed, it is common practice for an MTBS image analyst to produce a categorical fire severity map by interpreting an image on a computer screen without any direct knowledge of ground conditions (MTBS methods at http://www.mtbs.gov/methods.html) (Eidenshink et al. 2007). As a result, dNBR derived categorical maps are at risk to subjective evaluation and human error. In contrast, the RdNBR can be calibrated using field data from one fire and applied to another fire (Miller and Thode 2007). Maps produced by RAVG are based upon calibrations from fires in California (Miller and Quayle 2015). Maps derived from RdNBR using one-year post-fire images produce statistically identical classifications in areas with at least 10% pre-fire conifer tree cover (Miller and Quayle 2015). In RdNBR maps derived from immediate and one-year post-fire images calibrated to basal area (BA) change of trees, >85% of field validation plots ≥30m (one pixel width) inside ≥90% BA change polygon boundaries do not have any live trees (Miller and Quayle 2015). The inherent limitations of the MTBS data have been recognized and a framework has been suggested on how to overcome them so that the products will support research and planning efforts (Kolden et al. in press).

The following figures illustrate that the MTBS data for the Rim Fire under predict the amount of high severity by 50%.


RAVG
CBI calibrated
High (red) = 35%


CBI calibrated
1 year post-fire
High (red) = 30%



References:

Eidenshink, J., B. Schwind, K. Brewer, Z.-L. Zhu, B. Quayle, and S. Howard. 2007. A project for monitoring trends in burn severity. Fire Ecology 3(1): 3-21.

Miller, J.D., and A.E. Thode. 2007. Quantifying burn severity in a heterogeneous landscape with a relative version of the delta Normalized Burn Ratio (dNBR). Remote Sensing of Environment 109: 66-80.

Miller, J.D., and B. Quayle. 2015. Calibration and validation of immediate post-fire satellite derived data to three severity metrics. Fire Ecology *In Press*.

Safford, H.D., J. Miller, D. Schmidt, B. Roath, and A. Parsons. 2008. BAER soil burn severity maps do not measure fire effects to vegetation: a reply to Odion and Hanson. Ecosystems 11: 1-11.

114. Comment (Commenter 11): The DEIS does not accurately address scientific evidence, nor adequately address or analyze dissenting scientific sources, regarding the Natural Range of (historical) Variability (NRV) pertaining to high-severity fire patch size and proportion. In our scoping comments, we presented numerous data sets showing historical high-severity fire patches as large or larger than the ones in the King fire in unlogged forests prior to fire suppression (e.g., Leiberg 1902, Baker 2014), including a 19th-century high-severity fire patch mapped by Leiberg (1902) in the Rubicon canyon that overlaps with the largest high-severity fire patch in the King fire, and which was approximately the same size, or slightly larger. Clearly the forest was resilient to this large high-severity fire patch, given that mature forest regenerated in these areas. Yet pp. 7-8 of Appendix A of the DEIS (and the main body of the DEIS) completely ignores this evidence and, of the two sources relied upon in App. A (p. 7) for the proposition that historical high-severity fire patches were "rarely" over 150 acres in size, one (Minnich et al. 2000) was in forests of Mexico that are quite different than the forests of the Sierra Nevada in important ways (e.g., substantially less annual precipitation in Mexico, and therefore less biomass), and the other (Collins and Stephens 2010) pertained to two small contemporary fires, not historical ones, and

both fires were just over 5,000 acres in size. Clearly, the question of occurrence of historical high-severity fire patches the size of the largest in the King fire cannot be addressed by contemporary fires in which the entire fire acreage is far smaller than the high-severity fire patches the DEIS claims to be evaluating. It makes no logical sense.

Response: In mixed conifer and yellow pine forests, high fire severity patches have increased in size, departing from the natural range of variability (Safford 2013). The NRV of high fire severity patches documented in the scientific literature for Sierra Nevada ponderosa pine and mixed conifer forests was strongly dominated by small patches less than 10 acres in size (Sudworth 1900; Show and Kotok 1924; Kilgore 1973; Skinner 1995; Weatherspoon and Skinner 1995; Skinner and Chang 1996; Minnich et al. 2000; Bradstock et al. 2010; Collins and Stephens 2010). Some portion of the landscape would have also been comprised of large patches, but these would have rarely exceeded 150 acres in size (Minnich et al. 2000; Collins and Stephens 2010).

The high severity (>90% mortality) conifer mixed patches covered 39,687 acres on both FS and non-FS lands. There were 1,446 patches within this area of which the median patch size was 0.67 acres and the mean patch size was 27 acres with a standard deviation of 505 acres. High severity patch size mean within the King Fire is a close approximation of what Miller et al. (2012) found throughout recent fires in Sierra Nevada forests (30 acres in Miller et al. (2012). The minimum patch size (that could be detected) was 0.22 acre while the maximum patch size was 17,311 acres. The total area burned was weighted heavily toward large patches; 88 percent of the total high severity area was in patches >150 acres, which only comprised 1.1 percent of the total number of patches. The largest patch made up 44 percent of the total high severity patches. The maximum patch size was 17, 311 acres in size (FEIS, Appendix A, pgs. 7-8 and Table 4 on pg. 13).

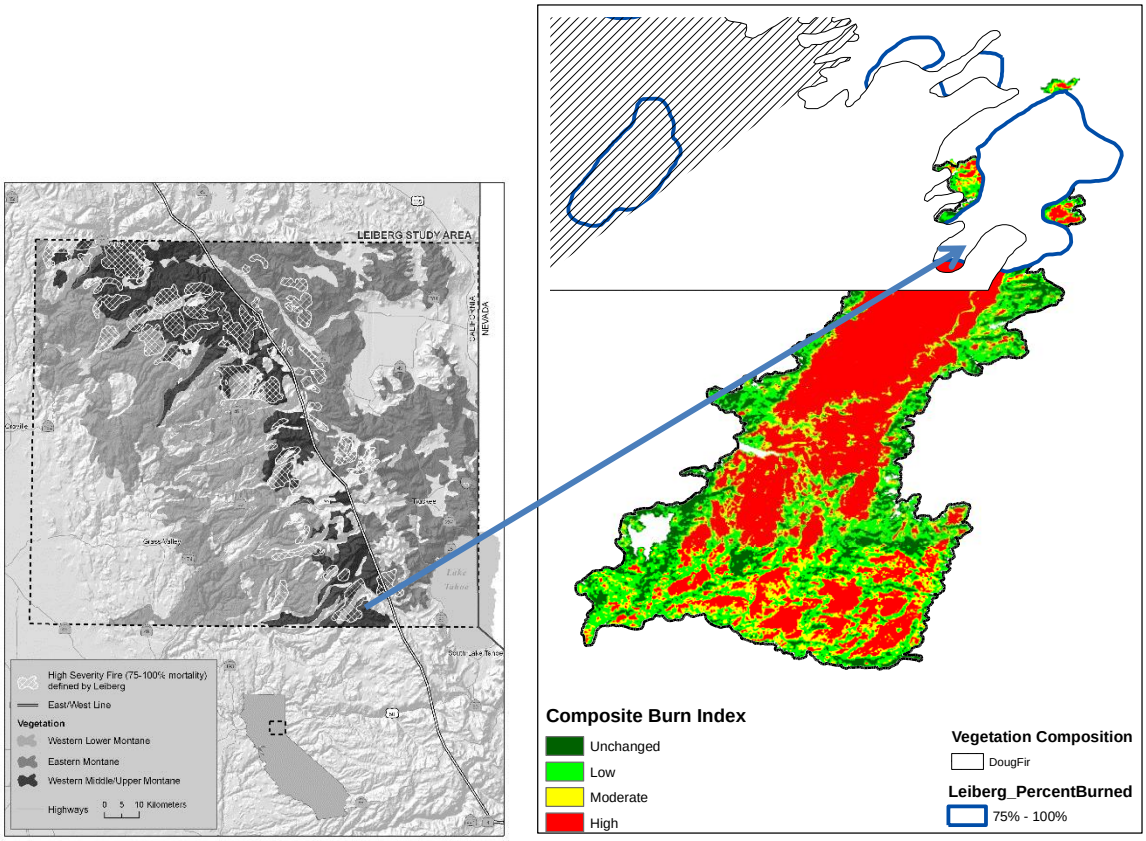


Figure 1. Leiberg spatial data compared to the actual footprint of the King fire. The vegetative fire severity is represented by the Composite Burn Index which more closely approximates the 75-100% estimates of Leiberg.

Leiberg (1902) took great lengths to map vegetation data throughout the Northern Sierra Nevada and estimate proportions of fire severity. Overall, Leiberg's (1902) results at least partly reflect presettlement conditions. Leiberg tallied burned area by watershed for the northern Sierra Nevada and estimated that 8% of the 19th century fire area had experienced "total destruction", i.e., stand replacement (75-100%). The spatial data mapped in the 1902 report only covers a small portion of the King fire, mainly the upper portion of the Rubicon drainage (Fig. 1). Leiberg (1902) does spend considerable time describing the Rubicon drainage which is defined as "198,000 acres, and a tract draining into Rubicon River containing, approximately, 45,120 acres". Of this area only a small portion of the upper Rubicon drainage was indicated as being affected by fire that burned 75-100% of the trees (see blue outline in Fig. 1). The records indicated that 32% of this drainage was affected by a high severity fire.

There are two limitations in interpreting this data. This percentage as stated by Leiberg (1902) includes chaparral which makes up about 5% of the drainage. We would expect these areas to burn at high severity. Secondly, as described by Leiberg (1902) all "accessible portions of both basins are pastured, the western by cattle, the eastern by cattle and sheep". In the last decades of the 1800s, there was a general decrease in overall fire frequency, but an increase in large destructive fires in many parts of the Sierra Nevada, from shepherds, miners, loggers, and other forest users (Sudworth 1900, Leiberg 1902, Vankat and Major 1978, Kilgore and Taylor 1979, Turrentine et al. 1982, Barbour et al. 1993, Cermak 2005). Shepherds also often set fire to the forest in the late summer or fall in order to clear the forest understory and improve forage, and in some cases these fires caused major damage to mixed conifer and red fir forests (Sudworth 1900, Leiberg 1902, Greeley 1907, Turrentine et al. 1982, Cermak 2005). Leiberg's (1902) estimates of fire severity may have been grossly estimated particularly at high elevations where the effects of human ignited fires were fairly common.

In the King Fire Ecological Analysis, high severity patches will be retained in all alternatives that occur throughout a range of sizes (FEIS Appendix A, pg. 13). All of the alternatives would maintain patches >500 acres in size with maximum patch sizes of greater than 2000 acres in size which still far exceeds historical estimates of patch sizes.

115. Comment (Commenter 11): The DEIS does not meaningfully take into account the evidence indicating that the Forest Service's RAVG system, which the agency is using to make its preliminary fire severity assessment, cannot accurately examine high-severity fire proportions and patch sizes (see, e.g., our scoping comments, and the map of RAVG high-severity versus final MTBS high-severity fire proportions and patch sizes in the Rim fire) because, for instance, it occurs well before flushing can be examined and consequently does not pick up numerous live trees. RAVG is therefore arbitrary in regard to important post-fire factors, namely a) the extent of live trees in areas the Forest Service is currently claiming are primarily or entirely dead, and b) the actual size of high-severity patches.

Response: See response to Comment 113.

116. Comment (Commenter 11): With regard to historical high-severity fire proportion, the DEIS not only fails to incorporate and address multiple scientific sources that we submitted, which show a much higher range of historical high-severity fire proportions than described in the DEIS,

but also misrepresents the sources that are cited. For example, on p. 6 of Appendix A of the DEIS, the DEIS claims that Leiberg (1902) and Show and Kotok (1924) found only 5% to 8% historical high-severity fire. Leiberg (1902, p. 41) actually reported that about 8% of the forest experienced 100% mortality (zero surviving trees), but 100% mortality is just a subset of high-severity fire, which is defined generally as 75-100% mortality. Leiberg (1902) explicitly mapped areas of 75-100% mortality in previously unlogged forests, and there was approximately 20% high-severity fire (75-100% mortality) in mixed-conifer forests (Hanson 2007). Leiberg (1902, p. 41) also made clear that he did not include high-severity fire patches **less than 80 acres in size**, and if he had included these, the high-severity fire proportion would be "considerably increased". Show and Kotok (1924) nowhere stated that historical high-severity fire proportions were 5% or 8%, and Show and Kotok (1925) mentioned 5% in reference to tree mortality levels in "surface fire", not crown fire (see p. 3 of Show and Kotok 1925). Safford (2013) and Meyer (2015), cited on p. 6 of Appendix A of the DEIS, not only misrepresented these historical sources, but also omitted discussion of many scientific studies that found much higher proportions (and patch sizes) of historical high-severity fire in mixed-conifer and ponderosa pine forests of the Sierra Nevada management region--the region covered by the Sierra Nevada Forest Plan Amendment (we have many times discussed these sources with both Safford and Meyer, and they are well aware of them). The table below contains a list and summary of just some of the sources that were omitted by Safford (2013) and Meyer (2015), and the DEIS.

Historical high-severity fire proportions in mixed-conifer and ponderosa/Jeffrey-pine forests in various portions of the Sierra Nevada management region of California.

Study	Location	High-severity fire proportion
Leiberg (1902)	Northern Sierra Nevada	>8% (ponderosa pine), >20% (mixed-conifer), and >39% (white fir) [a]
Beaty and Taylor (2001)	Southern Cascades	18-70%, depending on slope aspect
Bekker and Taylor (2001)	Southern Cascades	52-63%
Beaty and Taylor (2008)	Eastern Sierra Nevada	7-36%, depending on slope position
Baker (2014)	Western Sierra Nevada	31-39%
Hanson and Odion (2015)	Western-central Sierra Nevada	26%

[a] Hanson (2007) used digitized versions of Leiberg's mapping of high-severity fire areas in unlogged forests (areas mapped as logged were excluded), overlaid with forest type, to determine high-severity fire percentages in patches >32.4 ha. Because these percentages do not include patches <32.4 ha, they are underestimates (Hanson 2007). Leiberg (1902) explicitly noted that, if high-severity fire patches <32.4 ha were included, the amount of high-severity fire would be "considerably increased" (Leiberg 1902, p. 41). Mallek et al. (2013, Table 5) referenced this study with regard to 8% high-severity fire effects. However, this figure was based only on the narrowest subset of high-severity fire effects: areas with 100% tree mortality (Leiberg 1902, p. 41). Leiberg specifically mapped areas of 75-100% timber volume mortality (in patches >32.4 ha), corresponding to high-severity fire areas, and such areas comprised a much larger acreage than the areas of 100% mortality (Leiberg 1902, Plate VII; Hanson 2007).

Response: High severity fire is a component of all natural fire regimes, and given the variable and interacting roles of weather, fuels, and topography in driving fire behavior, it is statistically certain that a portion of fires in mixed conifer forests burned at high

severity over the previous millennia. It is also recognized that extreme events did occur. The central concern for management is not these sorts of extreme events, however (since they are largely driven by stochasticity), but rather the central tendency of the data.

The definition and scope of determining the natural range of variability (NRV) within the King Fire was described in the FEIS, Appendix A, pgs. 3 and 4. Both Safford (2013) and Meyer (2015) adhered to the process of determining NRV by extensively reviewing historic and current literature to come to a determination that was then used as part of the King Fire Ecological Analysis.

The literature the commenter cites presents proportions of fire severity across different landscapes, but they have serious limitations (the table below has specific responses to each of these studies). Both the Baker (2014) and Hanson and Odion (2015) studies were spatially extensive (330,000 hectares), but the findings and conclusions are inconsistent with recent studies (Stephens et al. 2015, Collins et al. 2015). Both Stephens et al. (2015) and Collins et al. (2015), analyzed historical timber inventory data that were collected systematically in mixed conifer landscapes to determine vegetation structure and compositions prior to European influence. Both studies revealed 1) forests had considerably low density, 2) overstory structure varied considerably across the landscape at fine (topographic variation) and coarse scales (elevation gradients) 3) understory structure was variable 4) estimates of high severity fire were 1-6% and 5) large diameter trees were present in most transects indicating long periods of time that were fire free supporting the existence of low and moderate severity fire. Stephens et al. (2015) compared his and others work to Baker (2014) and found that historic tree density was grossly overestimated with the General Land Office (GLO) data indicating that determinations of high severity proportions were also overestimated (Table 7 in Stephens et all (2015).

These differences can be attributed to limitations in the dataset and the landscape interpretations. A major problem with the Baker (2014) and Odion et al. (2014) is the biased plot location and tree selection. The Baker (2014) uses the General Land Office (GLO) witness tree data which only sampled 8 trees or fewer per square mile and assumed that areas of smaller trees represent the effects of high severity fire (Collins et al. 2015). This critical and very tenuous assumption (tree regeneration can occur under all sorts of ecological conditions), is the focus of a response paper written to the Baker analyses by Fule et al. (2014). In addition, it is not known whether shrub patches described in those studies/reports were the result of a single stand replacement fire or multiple fires. It is possible that small shrub patches were enlarged by subsequent fires, and therefore the amount of stand replacement in an individual fire would be less than what is implied by the observed shrub patch size. Odion et al. (2014) utilized the US Forest Service Forest Inventory and Analysis (FIA) program to infer the spatial extent of high-severity fire over the past 300+ years. They selected plots that were mostly located at high elevation which isn't applicable to the mixed conifer zone (Collins et al. 2015).

Baker's (2014) study is limited in geographic range focusing on disjunct locations with probably very different human impact at this time period. The vegetation reconstruction method utilizing General Land Office (GLO) surveys that Baker (2014) uses has known flaws and biases. Manies and Mladenoff (2000) found that interpolated vegetation maps "recreated" using GLO survey methods had inherent bias when compared against a "correct" air-photo map of the study area. Specifically, interpolated maps using GLO data were coarser in representation of the vegetation classes as compared to air-photo maps. Manies and Mladenoff (2000) found interpolated map had "…lower frequencies of smaller patches and higher frequencies of larger patches than the air-photo map." Low

severity fire is purported to create a fine, grained landscape structure (Beaty and Taylor 2001). In addition, Manies and Mladenoff (2000) found that larger trees were less likely to be chosen as witness trees due their higher chance of being cut for lumber and diminished length of survival as compared to smaller trees. If a method that recreates a vegetation map from GLO data intrinsically displays a higher amount of large patches as opposed to small patches (Manies and Mladenoff 2000) primarily composed of smaller diameter trees, it could be incorrectly concluded that an area had large patches of high severity fire regenerating younger-aged stand.

Odion et al (2014) also has limitations related to the interpretation of stand age from the FIA data which cannot be reliably utilized to determine the timing of past high-severity events. Hanson and Odion (2013) claimed to refute the trends of increasing high severity fire in the Sierra Nevada National Forests found by Miller et al. (2009b) and Miller and Safford (2012). Spatial data errors existed in the data layers and cartographic analysis. Additionally, forest types were grouped irrespective of fire regimes. They also included all fires regardless of the fire type and the ownership leading to inaccurate and spurious conclusions.

Vegetative severity mapping of the King Fire showed that 46,000 acres (47%) of the landscape had high burn severity (>90% decrease in basal area) (FEIS Appendix A, pg. 7). This number far exceeds any of the historical amounts of fire severity including both of the estimates by Baker (2014) and Hanson and Odion (2014). The King Fire Restoration DEIS analyzed the amount of area within each severity class that would remain following treatment as compared to the entire fire area (FEIS, Appendix A, pg. 7). The alternatives only showed modest reduction in the proportions of unchanged, low, moderate, and high severity across the landscape as compared to the existing conditions (FEIS, Appendix A, pg. 13, Table 3).

Study	Location	High-severity proportion	Response
Leiberg (1902)	Northern Sierra Nevada	>8% (ponderosa pine), >20% (mixed-conifer), and >39% (white fir)[a]	Overall, Lieberg (1902) reported that chaparral covered 5.7% of the mapped area. Estimates of high severity were likely enhanced due to human ignited fires throughout the study area.
Beaty and Taylor (2001)	Southern Cascades	18-70%, depending on slope aspect	The study area for Beaty and Taylor (2001) was limited in geographic scope (Cub Creek Research Natural Area – 1,587 ha in size) and the variation that is cited ranges across all aspects and slope positions (5.8% high severity on lower slopes, 23.4 % on middle slopes and 85.7% on upper slopes).
Bekker and Taylor (2001)	Southern Cascades	52-63%	The study area for Bekker and Taylor (2001) was limited in geographic scope (Thousand Lakes Wilderness – 2,042 ha in size) and was located in high elevations forest types (red fir, white fir, lodgepole).
Beaty and Taylor (2008)	Eastern Sierra Nevada	7-36%, depending on slope position	The study area for Beaty and Taylor (2008) was limited in geographic scope (General Creek Watershed– 2,000 ha in size) and the variation that is cited ranges across all aspects and slope positions (7% high

			severity on lower slopes, 11 % on middle slopes and 36% on upper slopes).
Baker (2014)	Western Sierra Nevada	31-39%	Baker (2014) used General Land Office (GLO) data from the mid- and late-1800s to generalize about tree densities in yellow pine mixed conifer forests in a number of locations across the western US and specifically the Sierra Nevada and the role of fire in driving these densities. This paper claims that current fire patterns are within NRV. Although a great source of information, GLO data has limitations covered in great detail by in Fulé et al. (2014) and Hagmann et al. (2013, 2014) and as such should be used only in appropriate analysis. Both (Stephens et al. 2015, Collins et al. 2015) highlight the limitations of Baker (2014). A few limitations used this data to interpolate (computer) landscape level tree densities. This is a limited use as using roughly 5-8 trees per square mile to model large landscapes is particularly challenging in heterogeneous landscapes like the yellow pine mixed conifer areas. Additionally, the determination of fire severity (high severity) is based on the presence of even aged trees despite a lack of any fire evidence (Stephens et al. 2015, Collins et al. 2015).
Hanson and Odion (2015)	Western-central Sierra Nevada	26%	Hanson and Odion (2013) claimed to refute the trends of increasing high severity fire in the Sierra Nevada National Forests found by Miller et al. (2009b) and Miller and Safford (2012). A number of errors in the analysis have been summarized by Safford et al. (in press). Spatial data errors existed in the data layers and cartographic analysis. Additionally, forest types were grouped irrespective of fire regimes. They also included all fires regardless of the fire type and the ownership leading to inaccurate and spurious conclusions.

Meyer, M.D., S.L. Roberts, R. Wills, M. Brooks, and E.M. Winford. 2015. Principles of effective USA federal fire management plans. Fire Ecology 11(2): 59–83. doi: 10.4996/fireecology.1102059

117. Comment (Commenter 11): The DEIS does not adequately disclose the fact that the empirical, published scientific data contradict the Forest Service's un-validated modeling exercises that claim post-fire logging will effectively reduce future fire intensity (see, e.g., Donato et al. 2006, Thompson et al. 2007, McGinnis et al. 2010). Moreover, the DEIS does not adequately address the fact that the empirical scientific literature concludes that, in the absence of post-fire logging,

most high-severity fire areas reburn at low- and moderate-severity (van Wagtendonk et al. 2012, Figure 5).

Response: While the modeling results do not provide a definitive estimate of the fuel loading when the next fire burns the area, it provides the public and decision maker with a sense of the relative magnitude of the impact.

"*A combination of field-collected data, geospatial data, fire modeling, professional judgment, and literature review is used to provide a landscape-level analysis of potential fire behavior and the environmental consequences of the project"* (FEIS, pg. 135).

The references from the commenter address some of the effects that salvage harvest can have on fire behavior and fuel loadings. Two of these references also state that any increases in surface fuel loading from salvage harvest can be mitigated by fuels reduction treatments such as prescribed burning or mechanical removal, which are actions proposed in the King Fire Restoration Project to reduce surface fuel loads. These studies focused more on short term fire behavior effects in these stands (untreated, treated, planted), but did not look at the long term fire effects, future fire severities, and safety issues that are associated with a high concentration of large logs (standing snags and 1000 hour surface fuels) on the landscape.

There have been numerous studies discussing the positive effects of salvage logging, as it relates to fire behavior and fuels reduction. Studies have shown that the initial pulse of elevated surface fuels in logged stands is relatively short-lived as deposition and accumulation of surface fuels from decaying snags causes surface fuel loadings in unlogged stands to exceed those of logged stands within 5 to 10 years after wildfire (Monsanto and Agee 2008; Keyser et al. 2009; Ritchie et al. 2013; Peterson et al. 2015).

Studies have shown that there is a strong positive relationship between initial fire severity and severity of a subsequent reburn (van Wagtendonk et. al 2012, Holden et al. 2010) The two principal mechanisms identified as being strongly tied to fire severity in the initial fires and the reburn were snag basal area and shrub cover. Results suggest that high to moderate severity fire in an initial fire can lead to an increase in standing snags and shrub vegetation, which in combination with severe fire weather, can promote high severity fire in the subsequent reburn of an area. Conclusions in van Wagtendonk et al. 2012 are mischaracterized by the commenter as van Wagendonk et al. (2012) found that: "Most vegetation types remained the same when burned with unchanged, low, or moderate severity, while high severity often resulted in conversion to montane chaparral". The severity of the first fire tended to influence the severity of subsequent fires. For example, areas that initially burned with unchanged, low, or moderate severity resulted in predominately the same severities in the second fire. Areas that first burned at high severity reburned with a higher proportion of high severity, primarily due to a conversion to chaparral. At the landscape scale, this means that there would be an increase in chaparral as high severity patches are converted from their initial vegetation type.

Fuels management can include reducing the loading of available fuels, lowering fuel flammability, or isolating or breaking up large continuous bodies of fuels (DeBano et al. 1998). Studies have shown that post-fire salvage harvest can reduce future surface woody fuel levels and the threat of high- severity fire in forests that are regenerating following wildfires (Ritchie et al. 2013, Peterson et al. 2015).

118. Comment (Commenter 11): The 2004 Framework EIS (p. 28) stated that one of the main purposes of the 2004 Framework was to "chang[e] a substantial acreage from Fuel Condition Class 2 or 3 to Condition Class 1". Condition Class was described as representing the number of normal fire return intervals that had been missed due to past suppression of fires by government agencies, with higher

Condition Classes indicating higher levels of fuel accumulation and higher potential for high-severity fire, or fire patches in which most or all trees are killed (EIS, p. 126).

The EIS concluded that, due to fuel accumulation from fire suppression, and resulting Condition Class 2 and 3 areas dominating the landscape, "fires that affect significant portions of the landscape, which once varied considerably in severity, are now almost exclusively high-severity, large, stand-replacing fires." However, the EIS did not offer any data source to support this statement.

New Scientific Information:
The studies empirically investigating this question have consistently found that forest areas that have missed the largest number of fire return intervals in California's forests are burning predominantly at low/moderate-severity levels, and are not experiencing higher fire severity than areas that have missed fewer fire return intervals:

Miller JD, Skinner CN, Safford HD, Knapp EE, Ramirez CM. 2012a. Trends and causes of severity, size, and number of fires in northwestern California, USA. Ecological Applications 22, 184-203.

Odion, D.C., E.J. Frost, J.R. Strittholt, H. Jiang, D.A. DellaSala, and M.A. Moritz. 2004. Patterns of fire severity and forest conditions in the Klamath Mountains, northwestern California. Conservation Biology 18: 927-936.

Odion, D.C., and C.T. Hanson. 2006. Fire severity in conifer forests of the Sierra Nevada, California. Ecosystems 9: 1177-1189.

Odion, D.C., and C.T. Hanson. 2008. Fire severity in the Sierra Nevada revisited: conclusions robust to further analysis. Ecosystems 11: 12-15.

Odion, D. C., M. A. Moritz, and D. A. DellaSala. 2010. Alternative community states maintained by fire in the Klamath Mountains, USA. Journal of Ecology, doi: 10.1111/j.1365-2745.2009.01597.x.

van Wagtendonk, J.W., K.A. van Wagtendonk, and A.E. Thode. 2012. Factors associated with the severity of intersecting fires in Yosemite National Park, California, USA. Fire Ecology 8: 11-32.

Below is a more detailed discussion of these studies:

Six empirical studies have been conducted in California's forests to assess the longstanding forest management assumption that the most fire-suppressed forests (i.e., the forests that have missed the largest number of fire return intervals) burn "almost exclusively high-severity", as the 2004 Sierra Nevada Forest Plan Amendment Final EIS (Vol. 1, p. 124) presumed. These studies found that the most long-unburned (most fire-suppressed) forests burned mostly at low/moderate-severity, and did not have higher proportions of high-severity fire than less fire-suppressed forests. Forests that were not fire suppressed (those that had not missed fire cycles, i.e., Condition Class 1, or "Fire Return Interval Departure" class 1) generally had levels of high-severity fire similar to, or higher than, those in the most fire-suppressed forests.

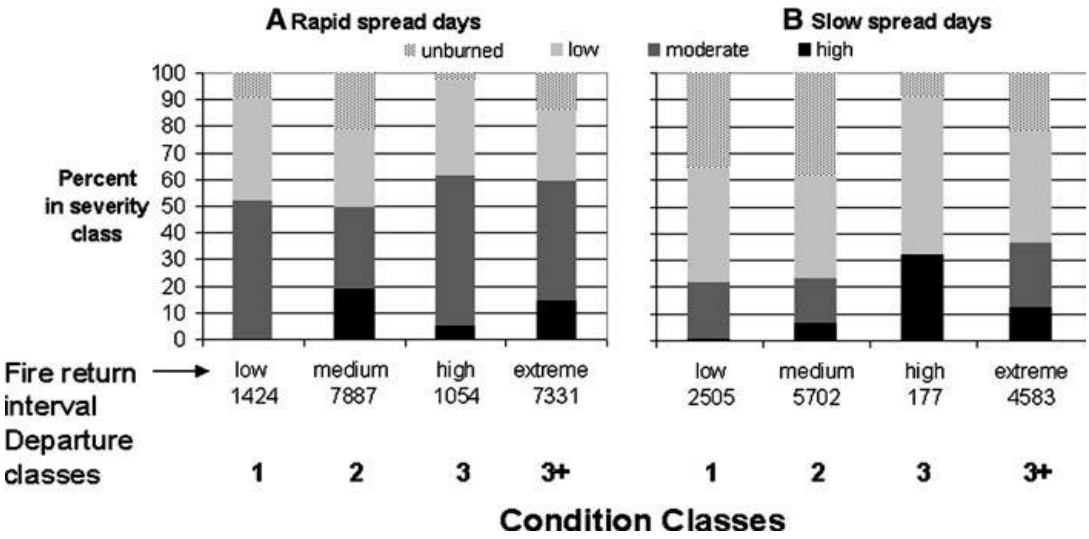


Figure 5 from Odion and Hanson (2006) (*Ecosystems*), based upon the three largest fires 1999-2005, which comprised most of the total acres of wildland fire in the Sierra Nevada during that time period (using fire severity data from Burned Area Emergency Rehabilitation (BAER) aerial overflight mapping), showing that the most long-unburned, fire-suppressed forests (Condition "Class 3+", corresponding to areas that had missed more than 5 fire return intervals, and generally had not previously burned for about a century or more) experienced predominantly low/moderate-severity fire.

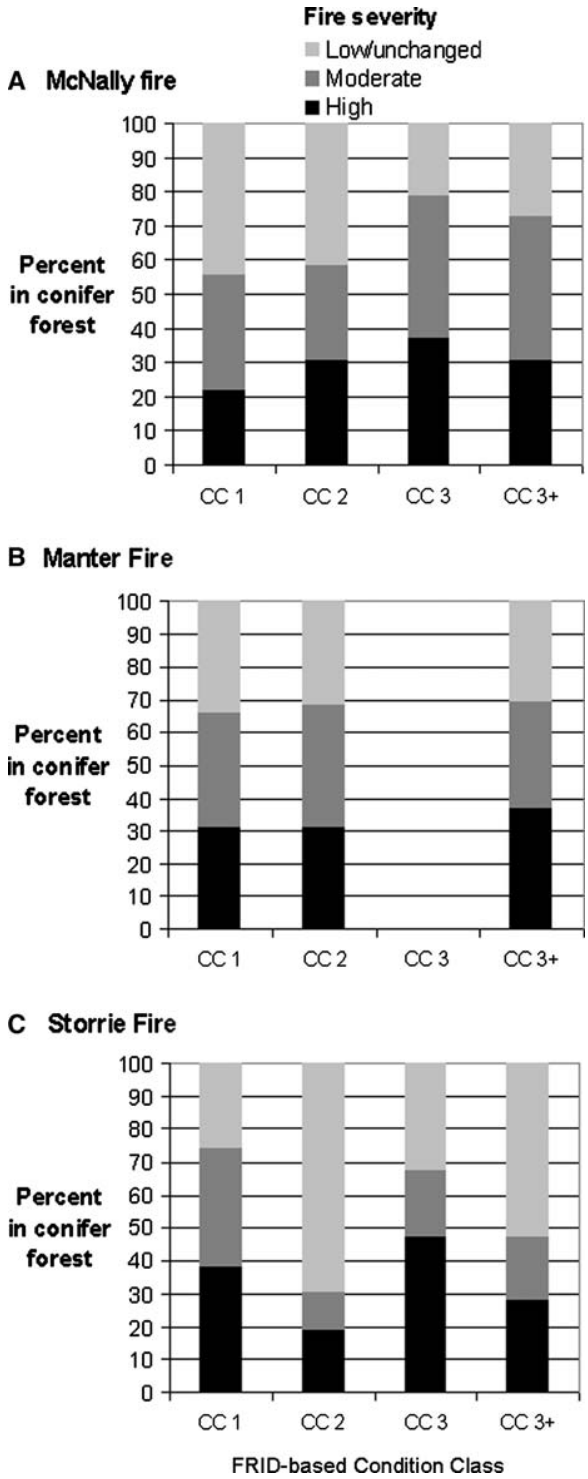


Figure 1 from Odion and Hanson (2008) (*Ecosystems*) (using fire severity data from satellite imagery for the same three fires analyzed in Odion and Hanson 2006), showing that the most long-unburned, fire-suppressed forests (no fire for a century or more) burned mostly at low/moderate-severity, and had levels of high-severity fire similar to less fire-suppressed forests (in one case, even less than Condition Class 1).

3) van Wagtendonk et al. (2012) (*Fire Ecology*), analyzing 28 fires from 1973-2011 in Yosemite National Park, found the following:

"The proportion burned in each fire severity class was not significantly associated with fire return interval departure class…[L]ow severity made up the greatest proportion within all three departure classes, while high severity was the least in each departure class (Figure 4)."

The most long-unburned, fire-suppressed forests—those that had missed 4 or more fire return intervals (in most cases, areas that had not burned since at least 1930)—had only about 10% high-severity fire (Fig. 4 of van Wagtendonk e al. 2012).

4) Odion et al. (2004) (*Conservation Biology*), conducted in a 98,814-hectare area burned in 1987 in the California Klamath region, found that the most fire-suppressed forests in this area (areas that had not burned since at least 1920) burned at significantly *lower* severity levels, likely due to a reduction in combustible native shrubs as forests mature and canopy cover increases:

"The hypothesis that fire severity is greater where previous fire has been long absent was refuted by our study…The amount of high-severity fire in long-unburned closed forests was the lowest of any proportion of the landscape and differed from that in the landscape as a whole ($Z = -2.62$, $n = 66$, $p = 0.004$)."

5) Odion et al. (2010) (*Journal of Ecology*), empirically tested the hypothesis articulated in Odion et al. (2004)—i.e., that the *reduction* in fire severity with increasing time-since-fire was due to a reduction in combustible native shrubs as forests mature and canopy cover increases—and found the data to be consistent with this hypothesis.

6) Miller et al. (2012a) (*Ecological Applications*), analyzing all fires over 400 hectares 1987-2008 in the California Klamath region, found low proportions of high-severity fire (generally 5-13%) in long-unburned forests, and the proportion of high-severity fire effects in long-unburned forests was either the same as, or *lower than*, the high-severity fire proportion in more recently burned forests (see Table 3 of Miller et al. 2012a).

Recently, Steel et al. (2015) (Ecosphere 6: Article 8) reported modeling results that predicted a modest increase in fire severity with increasing time since fire (e.g., 12% high-severity fire at 10 years after fire up to 20% high-severity fire at 75 years post-fire). Thus, even the most long-unburned forests (>75 years since the last fire) were predicted to have mostly low/moderate-severity fire effects, contrary to the assumption upon which the 2004 Framework was based. Moreover, even the modest predicted increase in fire severity reported by Steel et al. (2015) must be viewed with great caution in light of the fact that it was based upon zero data for mixed-conifer stands that had experienced fire less than 75 years previously (see Fig. 4 of Steel et al. 2015).

Response: Fire return interval departure (FRID) is considered an indicator of risk of high severity fire (Safford and Van de Water, 2014). For semiarid conifer forests in the western US that were historically characterized by frequent, mostly low severity fire, biogenic decomposition of dead biomass is very slow, so the major fuel reduction force was (and continues to be) fire itself. Since fuel is required to ignite and carry fire, and since fire behavior, including severity, is related to the amount of available and consumable fuel (Sugihara et al. 2006, Parks et al. 2014), anything that results in increased fuel will have a tendency to increase fire severity. This is a simple principle from physics. Fire suppression has had the result of removing fire as a controller of fuel amount in many low and middle elevation forest types in

the Sierra Nevada, which has led to an accumulation of fuel. Between 1984 and 2011, the fire severity data available from California show that in yellow pine and mixed conifer forests there is a strong positive relationship between fire severity and time since last fire Steel et al. (2015). The King Fire burned at 50 percent high severity (greater than 75 percent basal area loss) with few recorded fires in the project area in the last century.

Literature specific to fuels accumulation and fire severity were reviewed in the King Fire Restoration Project Analysis. Literature cited by the commenter was specifically reviewed and is included in the project file. The majority of this literature was not relevant to the project area because the studies were conducted in a different forest type. Others were not relevant to the purpose and need or proposed activities in the project.

119. Comment (Commenter 11): The 2004 Framework FEIS (p. 125) assumed that fire severity/intensity is increasing in Sierra Nevada forests.

Collins, B.M., J.D. Miller, A.E. Thode, M. Kelly, J.W. van Wagtendonk, and S.L. Stephens. 2009. Interactions among wildland fires in a long-established Sierra Nevada natural fire area. Ecosystems 12:114–128. ***(No increase in high-severity fire found in the study area within Yosemite National Park.)***

Crimmins, S.L., et al. 2011. Changes in climatic water balance drive downhill shifts in plant species' optimum elevations. Science 331:324-327. ***(Precipitation was found to be increasing [Figs. 2A and S1-C].)***

Dillon, G.K., et al. 2011. Both topography and climate affected forest and woodland burn severity in two regions of the western US, 1984 to 2006. Ecosphere 2:Article 130. ***(No increase in fire severity was found in most forested regions of the western U.S., including no increasing trend of fire severity in forests of the Pacific Northwest and Inland Northwest, which extended into the northern portion of the Sierra Nevada management region.)***

Hanson, C.T. , D.C. Odion, D.A. DellaSala, and W.L. Baker. 2009. Overestimation of fire risk in the Northern Spotted Owl Recovery Plan. Conservation Biology 23:1314–1319. ***(Fire severity is not increasing in forests of the Klamath and southern Cascades or eastern Cascades.)***

Hanson, C.T., and D.C. Odion. 2014. Is fire severity increasing in the Sierra Nevada mountains, California, USA? International Journal of Wildland Fire 23: 1-8. ***(Hanson and Odion (2014) conducted the first comprehensive assessment of fire intensity since 1984 in the Sierra Nevada using 100% of available fire intensity data, and, using Mann-Kendall trend tests (a common approach for environmental time series data—one which has similar or greater statistical power than parametric analyses when using non-parametric data sets, such as fire data), found no increasing trend in terms of high-intensity fire proportion, area, mean patch size, or maximum patch size. Hanson and Odion (2014) checked for serial autocorrelation in the data, and found none, and used pre-1984 vegetation data (1977 Cal-Veg) in order to completely include any conifer forest experiencing high-intensity fire in all time periods since 1984 (the accuracy of this data at the forest strata scale used in the analysis was 85-88%). Hanson and Odion (2014) also checked the approach of Miller et al. (2009), Miller and Safford (2012), and Mallek et al. (2013) for bias, due to the use of vegetation layers that post-date the fires being analyzed in those studies. Hanson and Odion (2014) found that there is a statistically***

significant bias in both studies (p = 0.025 and p = 0.021, respectively), the effect of which is to exclude relatively more conifer forest experiencing high-intensity fire in the earlier years of the time series, thus creating the false appearance of an increasing trend in fire severity. Interestingly, Miller et al. (2012a), acknowledged the potential bias that can result from using a vegetation classification data set that post-dates the time series. In that study, conducted in the Klamath region of California, Miller et al. used a vegetation layer that preceded the time series, and found no trend of increasing fire severity. Miller et al. (2009) and Miller and Safford (2012) did not, however, follow this same approach. Hanson and Odion (2014) also found that the regional fire severity data set used by Miller et al. (2009) and Miller and Safford (2012) disproportionately excluded fires in the earlier years of the time series, relative to the standard national fire severity data set (www.mtbs.gov) used in other fire severity trend studies, resulting in an additional bias which created, once again, the inaccurate appearance of relatively less high-severity fire in the earlier years, and relatively more in more recent years. The results of Hanson and Odion (2014) are consistent with all other recent studies of fire intensity trends in California's forests that have used all available fire intensity data, including Collins et al. (2009) in a portion of Yosemite National Park, Schwind (2008) regarding all vegetation in California, Hanson et al. (2009) and Miller et al. (2012a) regarding conifer forests in the Klamath and southern Cascades regions of California, and Dillon et al. (2011) regarding forests of the Pacific (south to the northernmost portion of California) and Northwest.)

Hanson, C.T., and D.C. Odion. Sierra Nevada fire severity conclusions are robust to further analysis: a reply to Safford et al. International Journal of Wildland Fire **24**: 294-295. ***(Safford et al. 2015 hypothesized that, if the analysis in Hanson and Odion 2014 had been restricted to wildland fires in mixed-conifer and yellow pine forests on National Forest lands, a significant upward trend in fire severity since 1984 might have been evident. Hanson and Odion (in press) empirically tested this hypothesis and found, again, no increasing trend in fire severity in the Sierra Nevada.)***

Miller, J.D., C.N. Skinner, H.D. Safford, E.E. Knapp, and C.M. Ramirez. 2012a. Trends and causes of severity, size, and number of fires in northwestern California, USA. Ecological Applications 22:184-203. ***(No increase in fire severity was found in the Klamath region of California, which partially overlaps the Sierra Nevada management region.)***

Response: Literature presented by the commenter regarding fire severity was reviewed for the King Fire analysis in addition to other scientific publications on the topic. Many of the studies cited by the commenter were a different fire regime and forest type then the King Fire. Data from Miller et al. (2012a) concludes that fire severity is increasing in the Sierra Nevada where the King Fire burned.

With 50 percent of the King Fire area burning at greater than 75 percent basal area loss, the literature discussing whether or not fire severity is increasing is irrelevant to the need to treat an area of forest that has burned with high severity fire. In order to manage and restore these areas it is necessary to do active management actions that will reduce future fuel loads are restore areas of conifer forest. The Forest Service's objectives are to increase resiliency to fires on the landscape and to provide for the safety of the public and woodworkers in this area of the Forest. There are numerous studies documenting the historical occurrence of frequent, low severity fires in mixed conifer forests throughout the Sierra Nevada (Beaty and Taylor 2008, North et al. 2009, Collins and Skinner 2014 in PSW-GTR-247 Ch. 4, Collins and Stephens 2010, Scholl and Taylor 2010, Skinner and Chang 1996). Collectively these studies suggest that historical forests had a low incidence of high severity or stand replacing fire. The goal is not to prevent fires

within the forest, but to modify fire behavior to lower severity, and to bring these areas back to a more historic heterogeneous structure where fire complements and sustains the system instead of destroying it. Alternative 1, the "No Action" alternative describes the effects of performing no treatment on the public and forest resources.

120. Comment (Commenter 11): The 2004 Framework assumed that home protection is best accomplished by a ¼-mile wide "Defense Zone" surrounding towns, and groups of cabins, as well as an additional 1.5-mile wide "Threat Zone" surrounding the Defense Zone.

New Scientific Information:

Cohen, J.D., and R.D. Stratton. 2008. Home destruction examination: Grass Valley Fire. U.S. Forest Service Technical Paper R5-TP-026b. U.S. Forest Service, Region 5, Vallejo, CA. ***(The vast majority of homes burned in wildland fires are burned by slow-moving, low-severity fire, and defensible space within 100-200 feet of individual homes [reducing brush and small trees, and limbing up larger trees, while also reducing the combustibility of the home itself] effectively protects homes from fires, even when they are more intense).***

Gibbons, P. et al. 2012. Land management practices associated with house loss in wildfires. PLoS ONE 7: e29212. ***(Defensible space work within 40 meters [about 131 feet] of individual homes effectively protects homes from wildland fire. The authors concluded that the current management practice of thinning broad zones in wildland areas hundreds, or thousands, of meters away from homes is ineffective and diverts resources away from actual home protection, which must be focused immediately adjacent to individual structures in order to protect them.)***

Response: The Forest Service agrees that treatment immediately adjacent to homes is critical to reduce the loss of homes during a wildfire, and that treatment of the wildland does not protect homes without the treatment of fuels adjacent to homes. However, the King Fire Restoration project is proposed to provide for public and woodworker safety, to restore the area of the forest that burned at high severity during the King, to recover the value of trees killed during the 2014 King Fire, and to implement a strategic fire management area that can be used to more effectively and safely manage wild and prescribed fires. The change in forest structure from fire exclusion has been documented (Collins et al 2011; Knapp et al 2013). The Wildland Urban Interface Problem: A Consequence of the Fire Exclusion Paradigm (Cohen, 2008) acknowledges that in some ecosystems, such as the ponderosa pine (Pinus ponderosa) forests in the western U.S., the reduction of fire occurrence has resulted in significant changes to the species composition and increases in the amount of live and dead vegetation which has produced fuel accumulations and arrangements that have enhanced the potential for the extensive areas of high intensity wildland fires experienced in recent years. In these areas it is important to treat not only the areas near homes, but also the wildland that those homes are built in both for the resilience of the forests and for the ability to safely and effectively fight fire in the area. As documented by Kennedy and Johnson (2014): the 2011 Wallow Fire in Arizona USA burned through recently implemented fuel treatments in the wildland surrounding residential communities in the WUI, and those fuel treatments have been credited with providing firefighter opportunities to protect residences during the Wallow Fire and thereby preventing the loss of homes that otherwise would have been burned.

Fuels Reduction

121. Comment (Commenter 11): Petersonet al. 2015 is irrelevant to the King Fire DEIS and situation as it did not actually analyze, and instead simply assumed, the impacts of salvage logging on future fire. It therefore cannot be relied upon regarding fuel issues. In addition, a USFS fire/fuels scientist, Dr. Mark Finney, recently concluded that fuel breaks, like the kind relied upon in the King DEIS, do not work.

Response: Information from Peterson et al. (2015) was appropriately used to discuss fuel accumulations over time under different alternatives. Peterson et al. (2015) compared fuel accumulation dynamics for up to 27 years across 68 wildfires in logged versus unlogged stands that burned at high intensity. They found that, in unlogged stands, woody fuel accumulations were lower initially but were greater over time compared to logged stands, and concluded that post-fire logging can significantly reduce future ground fuel accumulations. The results of Peterson et al. (2015) agree with those of Monsanto and Agee (2008), Keyser et al. (2009), and Ritchie et al. (2013). Peterson, Dodson, and Harrod (2014) found that post-fire logging altered post-fire fuel succession by: 1) greatly accelerating the deposition of surface woody fuels from logged snags, 2) reducing peak loadings of large diameter woody fuels, and 3) initiating the woody fuel decay earlier.

Because of the limitation associated with mechanical treatment in the Sierra Nevada and the continued accumulation of fuels without the frequent fires that historically maintained the ponderosa pine/mixed conifer forests, many researchers have advocated prescribed fire and managed fire in the Sierra Nevada in addition to mechanical treatments (North et al. 2015). Mark Finney's recent conclusions are that prescribed fire needs to be used more as a management tool. The establishment of Strategic Fire Management Zones in the King Fire Restoration Project based on the Fire Management Strategy within the King Fire Area (Appendix C) to facilitate fire management and prescribed fire within this landscape is in line with this concept.

Hazard Tree Removal

122. Comment (Commenter 11): With regard to roadside logging, the DEIS does not adequately analyze adverse impacts of the highly controversial use of mortality guidelines used to predict mortality of trees, and used to remove large, live trees—including old-growth trees—many of which would otherwise survive and naturally reforest the area with local genetic diversity that is specially adapted to each specific location, through many thousands of years of evolution.

Response: The project uses the "Marking Guidelines for Fire-injured Trees in California" (Smith and Cluck 2011), which is based upon tree mortality models from the latest scientific research by Pacific Southwest Region Forest Health Protection Staff and Fire Sciences Laboratory at the Rocky Mountain Research Station (Hood, Sharon M.; Smith, Sheri L.; Cluck, Daniel R. 2010. Predicting mortality for five California conifers following a wildfire. Forest Ecology and Management. 260: 750-762).

These well established guidelines are based on the best available science documenting post-fire conifer mortality in California and their use has contributed to the success of many post-fire salvage and restoration projects. The project has been designed to be conservative in the removal of live trees by using a 90 percent probability of mortality in California spotted owl PACs and a 70 percent probability of mortality outside of PACs. The 70 percent probability of mortality identified meets project objectives by capturing fire-killed trees, as well as those that have green needles but a high probability of mortality due to post-fire stressors, while still

retaining the vast majority of trees with green-needles that are likely to survive and provide a future seed source. The commenter provides no contradictory science to identify a differing marking guide they believe should have been used.

NEPA and NFMA

123. Comment (Commenter 11): The DEIS (p. 3-252) claims that the massive application of herbicides proposed in the Proposed Action would not adversely affect the owls when they eat small mammal prey that have ingested vegetation covered by these herbicides, or which have the herbicides on their fur from being sprayed directly, or brushing against vegetation that has been sprayed. But the DEIS provides no explanation for this conclusion. This does not meet NEPA's hard look standard.

Response: The USFS and SERA risk assessments (the best scientific information available) and project specific worksheets were used to identify potential risks to wildlife species in the project area. This information was documented in the Terrestrial Wildlife Herbicide Exposure Analysis (TWHEA), which is summarized and referenced in the FEIS on page 304. The project specific analysis found that the potential for direct toxicological effects to the spotted owl is negligible for glyphosate at the proposed application rate based on acute exposure scenarios involving the consumption of contaminated mammalian prey and contaminated water by a carnivorous bird (FEIS page 304; TWHEA pages 4 and 5). Likewise, the chronic exposure scenarios involving contaminated water do not suggest direct toxicological impacts (FEIS page 304; TWHEA page 5). The quantitative risk characterization is expressed as the HQ compared to a Level of Concern (LOC). The LOC for interpreting the HQ is 1. Any value above 1 is taken as an indication that risk to the receptor is plausible (TWHEA page 1).There is little potential risk from owls eating contaminated mammals as none of the HQs are above 1 (0.000002 to 0.02) (TWHEA page 5).Furthermore, it is unlikely that 100% of the owl's diet would contain contaminated prey, given their large home range relative to the work area (TWHEA page 5).

124. Comment (Commenter 11): No Biological Evaluation for the California spotted owl was prepared, contrary to Forest Service regulations, and the DEIS nowhere addresses whether the Proposed Action, or other action alternatives, would create a trend toward listing of the California Spotted Owl under the ESA. We assert that the action alternatives would do just that in light of the situation. The silence of the DEIS in this regard for this Sensitive Species violates not only Forest Service regulations (regarding required determinations for Sensitive Species) and the Eldorado National Forest forest plan, but also violates NEPA's hard look standard. How can the public assess the impacts of the proposed logging project on California Spotted Owls when the Forest Service won't let the public know whether their planned logging may lead to the loss of viability and the ESA listing of the California Spotted Owl population? The DEIS's impacts analysis with regard to the owls is flawed as a result. For example, the Forest Service Manual requires, in relevant part:

2670.12 - U.S. Department of Agriculture Directives

Departmental Regulation 9500-4. This regulation directs the Forest Service to:

1. Manage "habitats for all existing native and desired nonnative plants, fish, and wildlife species in order to maintain at least viable populations of such species."

3. *Avoid actions "which may cause a species to become threatened or endangered*."

2670.22 - Sensitive Species

1. Develop and implement management practices to *ensure that species do not become threatened or endangered because of Forest Service actions*.

2. 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.

2670.32 - Sensitive Species

2. Review programs and activities as part of the National Environmental Policy Act of 1969 process through a biological evaluation, to determine their potential effect on sensitive species.

3. Avoid or minimize impacts to species whose viability has been identified as a concern.

4. Analyze, if impacts cannot be avoided, 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 line officer, 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*.) (emphasis added).

Management for sensitive species, and delegation of sensitive species designation (FSM 2672.1)**:** 2672.1 - Sensitive Species Management. Sensitive species of native plant and animal species must receive special management emphasis to *ensure their viability and to preclude trends toward endangerment* that would result in the need for Federal listing. *There must be no impacts to sensitive species without an analysis of the significance of adverse effects on the populations, its habitat, and on the viability of the species as a whole*. (emphasis added).

FSM 2672.41 - Objectives of the Biological Evaluation
1. *To ensure that Forest Service actions do not contribute to* loss of viability of any native or desired non-native plant or contribute to animal species or *trends toward Federal listing of any species*. (emphasis added).

The Forest Service simply did not conduct the required analysis or make the required determination, and certainly did not do so in a document where the determination could be vetted through the public comment process, as required by NEPA. For this reason, not only does the DEIS violate NFMA, but a supplemental DEIS is required in order to include the required analysis/determination that the current DEIS lacks.

Response: Analysis of impacts to California spotted owl (CSO) were described in Chapter 3 of the FEIS, pages 298 to 311, Appendix E, and summarized on page xxv). The affected environment included information on suitable habitat, population status and trend information, management direction, survey information, and CSO Protected Activity Centers (PACs). It also included information regarding post-fire landscapes. Environmental consequences included information on the effects of project actions at the stand, territory and landscape scale as well as effects by alternative and cumulative effects considering current and future foreseeable actions. FEIS Appendix E described the evaluation of CSO PACs in the King Fire in compliance with the Forest Plan. The FEIS took a hard look at the potential effects of the Project on the owl by disclosing the impacts at the PAC, territory and landscape scales. A BE has also been prepared,

taking into account post-fire survey information collected through the spring and summer of 2015. The proposed treatment areas and design criteria in the alternative as modified by the Decision further mitigates potential for effects to owl. The Decision details the changes and the BE describes and quantifies how those changes contribute to spotted owl protection. The Forest Service Manual cited by the commenter is out of date in some sections, such as 2670.12. Department Regulations 9500-004 was updated in 2008. The following would be most applicable now: Departmental regulation 9500-004 directs Department agencies to: (1)Conduct activities and programs "to assist in the identification and recovery of threatened and endangered plant and animal species"; (2) Avoid actions "which may cause a species to become threatened or endangered"; (3) Consult "as necessary with the Departments of the Interior and/or Commerce on activities that may affect threatened and endangered species": and (4) Not "approve, fund or take any action that is likely to jeopardize the continued existence of threatened and endangered species or destroy any habitat necessary for their conservation unless exemption is granted pursuant to subsection 7(h) of the Endangered Species Act of 1973, as amended." The project is consistent with Forest Plan direction with respect to CSO. To reduce potential effects to CSO, the alternative as modified by the Decision eliminates most treatments occurring within 500 feet of low severity or unburned CSO habitat within spotted owl territories. A BE has been prepared for the Decision and finds that the alternative as modified by the Decision would not result in a trend towards Federal listing or a loss of viability of spotted owls in the planning area (BE) given the project design criteria and areas where treatment has been avoided.

125. Comment (Commenter 11): The analysis of impacts of the Proposed Action with regard to ground cover (DEIS, pp. 3-187 through 3-188) violates NEPA's hard look standard because it does not candidly disclose or analyze (a) the extent of existing (current) ground cover (including live vegetation), and (b) the extent to which this current ground cover (including live vegetation) would be killed by post-fire tractor logging and log skidding.

Response: The Forest Service has taken a hard look by considering and disclosing the environmental impacts of the alternatives including the proposed action in the DEIS and FEIS. The analysis for ground cover (soil cover) is documented in the FEIS soil section in Chapter 3, pg. 189 to 191 while Table 3S.5, pg.195 (Summary of Indicators by Alternative) provides a summary of the effects from the proposed alternatives to soil cover.

The following excerpts are examples of where the FEIS discusses the topics of existing ground cover and the associated effects of the proposed activities.

"*The fire removed much of the soil cover (vegetation, leaf litter and woody debris) in the areas proposed for project activities. Salvage, biomass removal, and mastication activities could indirectly affect sensitive plants through soil compaction, alteration of hydrology, increased erosion and sedimentation, and damage to recovering vegetation.*" (FEIS pg. 73)

"*Field work during the BAER assessment and for this project verified the existing soil survey information, investigated current soil conditions and effects of the fire, and management capabilities.*" (FEIS pg. 172)

"*While qualitative estimates of the effects of management activities on soils are generally considered sufficient to meet project analysis objectives, quantitative field survey results and remotely sensed information were used to describe the existing condition and to support the analysis of effects of management activities.*" (FEIS pg. 182)

"*An adequate level of soil cover is needed to maintain soil stability and prevent accelerated erosion. Effective soil cover consists of low-growing vegetation (grasses, forbs, and prostrate*

shrubs), plant and tree litter (fine organic matter), surface rock fragments, and may also include applied mulches (straw or chips)." (FEIS pg. 182)

"*Effective soil cover was estimated in field surveys and was used to correlate existing and potential soil cover with high resolution satellite imagery*." (FEIS pg. 183)

"*Field crews collected data on the quantity and quality of soil cover and logs on the ground.*" (FEIS, pg. 183)

As described in Chapter 3 of the FEIS, "*the goals of field observations were to identify soil properties useful in confirming the accuracy of the soil survey, to identify existing soil conditions, to understand soil response to proposed activities management and to correlate the site conditions to remotely sensed data. Approximately 70 plots were recorded. Site observation methods were developed for rapid assessment by field crews. Plot selection was stratified based on burn severity, soil type, topography, and visual satellite imagery expression. Soil cover is the most important soil characteristic estimate following a wildfire and any subsequent activities post-fire. Observations were made to qualify the existing condition and to help watershed personnel correlate multi-spectral imagery with site characteristics.*" (FEIS pg. 185)

Additionally, Chapter 3 of the FEIS discusses *that while it is not feasible to predict the soil cover following treatments for every location, general assumptions can be made in regard to the departure of soil cover from pre-existing levels based on proposed activities. Chase (2006) found that both tractor logging and cable logging increased the amount of bare soil compared to burned and unlogged control plots. Fire and Fuels in Chapter 3 also discusses the material expected to be left after salvage operations. Fuel treatments are also expected to affect the amount of soil cover. Machine piling with a rake-fitted dozer followed by burning is expected to reduce soil cover to less than 20 tons per acre, creating areas where soil cover may go below threshold values*. (FEIS pg. 189 to 190)

The FEIS states that activities could decrease the ground vegetation in the short term compared to unlogged areas, but also points out that post-logging soil cover requirements and mastication in some units would increase overall groundcover. In reality, some areas will have reduced erosion and some areas will have increased erosion depending on post-salvage cover, site conditions, and operator skill level. Soil design criteria and proposed activities were developed with consideration of the higher impacts predicted by Wagenbrenner et al (2015) and observed during forensic monitoring of the American Fire Recovery project to ensure greater soil protection in the King Fire Restoration project. Erosion Hazard Rating modeling results showed substantial reduction in erosion with incorporation of these design criteria, and much of the analysis area is expected to remain below minimum threshold values for effective soil cover and will continue to exceed soil stability thresholds.

The field work for the soil analysis primarily occurred immediately after the fire and into early spring of 2015. Soil cover is increasing, but recovery is inconsistent across the landscape. Photos 1 and 2 show examples of variable vegetation recovery (the locations are within two miles of each other). Photo 1 shows vigorous vegetation recovery (primarily bear clover) in an area with moderate burn severity along the Rubicon Canyon whereas Photo 2 shows very little recovery in an area of high soil burn severity (tributary to Big Grizzly Creek). Both photos were taken on July 14, 2015.

Photo 1 – Bear clover recovery in the Rubicon River Canyon (July 14, 2015).

Photo 2. Very little recovery in a drainage with high soil burn severity in a tributary to Big Grizzly Creek.

It is important to note that shrub/understory canopy cover does not necessarily act as effective soil cover. While understory canopy cover reduces rain velocity and impact of rain drops, there can be large areas of bare ground underneath the canopy cover that remain susceptible to rill erosion. With respect to soil erosion analysis, soil cover does not include the entire understory canopy but only that part of the vegetation that is rooted in the ground or very low to the ground. It must be noted that despite difference in shrub canopy cover in both Photos 1 and 2, effective soil cover remains below 50% in both photos. From a distance, what appears to be extensive ground cover is understory canopy that is not protecting the soil from rilling. The differences between shrub/canopy cover versus effective soil cover are further illustrated in Photos 3 and 4 below, which were taken on Forest Road 11N59 adjacent to Soldier Creek on June 10th. Note that this is a gravel-covered road, and all soil on the road surface has been deposited since the fire. While there is substantial vegetation recovery on the hillslope above the road, it was not effective in preventing extreme erosion during a precipitation event that occurred 5 days prior. This is because the recovery is in the crown of the shrub layer, which does not provide effective soil cover in this location.

Photo 3. Widespread erosion and sedimentation originating from a revegetating hillslope.

Photo 4. More erosion from the same hillslope as Photo 3. Note the prolific deer brush growth on the hillslope above.

126. Comment (Commenter 11): The DEIS violates NEPA by failing to fully consider and analyze a reasonable range of alternatives, particularly action alternatives that would be capable of achieving conservation of spotted owls given the species' severely declining status. None of the alternatives by themselves: a) limit, at least to a large degree, tree felling to roads maintained for general public use (maintenance levels 3-5) or that are indispensable for access to private inholdings or critical infrastructure, especially given the information regarding the impacts of post-fire logging to Black-backed Woodpeckers, California Spotted Owls, and many other birds strongly associated with complex early seral forest; and/or b) prevent post-fire logging within, at least, 1.5 kilometers of California Spotted Owl nest/roost sites (except for hazard tree felling along Level 3-5 roads), as recommended by Bond et al. (2009) and Lee and Bond (2015).

Response: Under the CEQ regulations, the Agency is required to: "Study, develop, and describe appropriate alternatives to recommended course of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources as provided by 102(2)(E) of the Act" (40CFR1501.2(c)). Reasonable alternatives to the proposed action should fulfill the purpose and need and address unresolved conflicts related to the proposed action (FSH 1909.15, Chapter 10, section 14).

The EIS shall document the examination of reasonable alternatives to the proposed action. An alternative should meet the purpose and need and address one or more significant issues related to the proposed action. Since an alternative may be developed to address more than one significant issue, no specific number of alternatives is required or prescribed [36 CFR 220.5(e)].

Based on the seven significant issues identified as a result of public scoping (FEIS, pgs. xxiii and 7 to 8), the Forest Service developed three alternative proposals that achieve the purpose and need differently than the proposed action (FEIS, Chapter 2). One of the significant issues (Issue 1) was specific to the California spotted owl. "Issue 1: The proposed salvage harvest in California spotted owl (CSO) territories would impact CSO foraging habitat and lead to loss of occupancy." Alternative 3 was designed to address this issue by retaining greater amounts of post-fire habitat for species that utilize complex early-seral forest and early-seral shrub habitats and limits salvage and reforestation activities where post-fire conditions are within the natural range of variation.

One of the purposes of the project (Purpose and Need #1) is to: *Reduce the risk from falling dead, dying, and damaged trees that pose a significant safety concern to forest visitors and workers, and create a hazard to private property, infrastructure, and cultural resources.* (FEIS, pg. 4) As related to roads, hazard tree removal is proposed to occur on National Forest System roads open to the public [which includes maintenance level (ML) 2, 3, 4, and 5 roads] and roads needed for access to treatment areas. "Hazard trees to be removed are dead and dying trees that have potential to reach the road or property and live trees that are sufficiently damaged or defective to pose a risk of falling within the next five years (FEIS, pg. 5). Design Criteria TW-8 (FEIS, Table 2.15) was developed to achieve desired conditions within post-fire spotted owl PACs by providing "higher than average levels of snags and down woody material" within post-fire PACs through: "1) Along ML 1 and ML 2 roads bisecting PACs, fell only imminent hazard trees with >90% probability of mortality. Along ML 1 and ML 2 roads bisecting PACs, retain felled trees in the largest size available (> 15" dbh and >20' long) providing up to 15 tons/acre)."

An alternative that by itself, limits, at least to a large degree, tree felling to roads maintained for general public use (maintenance levels 3-5) or that are indispensable for access to private inholdings or critical infrastructure would not mitigate the significant safety risk of hazard trees falling across roads that are open to the public or for forest worker safety. Maintenance levels are defined by the Forest Service Handbook (FSH 7709.58, chapter 10, section 12.3) as the level of service provided by, and maintenance required for a specific road. ML 2 roads are generally open for use by high-clearance vehicles, but many serve as main access routes throughout the Forest. Traffic on some of the level 2 roads in the project area is minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Other level 2 roads proposed for treatment in the project area are main access routes to areas including Nevada Point Ridge, Big X Mountain, Poho Ridge, Peavine Ridge, and Jay Bird Canyon. Not treating level 2 roads would leave the public and woods workers at risk on the majority of travel routes throughout the project area and would constrain safe and efficient access to large areas by firefighters. The majority of the project area would not be able to be treated if hazards on these roads were not abated. Roads would not be safe for public travel and entire areas of the Forest would therefore need to be closed for the next several years to provide for public safety. Heavy fuel accumulations would result in the majority of the project area not treated as described for Alternative C, which was considered but eliminated from detailed study. Specific ML 1 roads (basic custodial care) are deemed necessary for project implementation. Providing a safe environment for both the public and forest workers is critical and the reason for the removal of dead and damaged trees that could fall onto roads. Only those level 1 roads proposed for use in this project have been identified for hazard tree removal. Precluding that removal on these roads would eliminate the ability to treat areas accessed by those roads and would therefore limit the ability of the project to meet the purpose and need to remove dead trees in strategic fire management areas to improve the agency's ability to manage and control future fires and to actively manage severely burned areas to facilitate restoration and resilience.

In regards to an alternative that prevents post-fire logging within, at least, 1.5 kilometers of California Spotted Owl nest/roost sites (except for hazard tree felling along Level 3-5 roads). Alternative C was considered but was eliminated from detailed study because it did not meet the purpose and need for the project, as described in the FEIS, pgs. 40 to 45.

127. Comment (Commenter 11): The DEIS violates NEPA's reasonable range of alternatives requirement by failing to consider **any** range of implementation/impacts with regard to roadside "hazard" tree removal (all action alternatives are identical in this respect-see pp. xvii through xviii), and appear to include not only all miles of roads maintained for public use in the proposals for roadside hazard tree logging, but also all miles of maintenance level 1 and 2 roads, which are not maintained for public use. Most or all of the maintenance level 2 roads—which are only for high-clearance vehicles—could easily be closed (certainly it is within the scope of consideration of a reasonable range of alternatives that some substantial portion of these roads could be closed for some suitable period of time and/or permanently—no use of level 2 roads, whether it be for recreation or otherwise, can automatically trump wildlife conservation, especially conservation of rare and/or declining species), and maintenance level 1 roads are, by Forest Service definition, **already closed** and pose no "hazard" to the public. Thus, most or all of the proposed logging along maintenance level 1 and 2 roads is not necessary, especially any logging of such roads in order to support additional commercial timber extraction and removal of large live and mature trees.

Response: See also response to Comment 126 as related to the reasonable range of alternatives and roadside hazard tree removal along ML 1 and 2 roads.

The King Fire Restoration Project focuses on management of a severely burned landscape, including fuels reduction and activities to facilitate restoration and resilience. As described in the FEIS (pg. 2), "The objectives of this project are to maintain the ecological integrity of post-fire habitat; reduce future fuel loadings in strategic areas important to fire control; increase resiliency of growing forest to future fire; reduce safety hazards to people and risks to buildings, infrastructure, and cultural resources; recover some of the economic value of dead trees to help pay for restoration activities and contribute to societal needs for wood products; take advantage of opportunities for research to increase knowledge regarding effects on the environment from large fires; and reduce sediment to streams and large woody fuel accumulation in sensitive areas. The long-term goal for the fire area is to move toward desired future conditions as defined by the Sierra Nevada Forest Plan Amendment (SNFPA)."

Only those level 1 roads proposed for use in this project have been identified for hazard tree removal. Precluding that removal on these roads would eliminate the ability to treat areas accessed by those roads and would therefore limit the ability of the project to meet the purpose and need to remove dead trees in strategic fire management areas to improve the agency's ability to manage and control future fires and to actively manage severely burned areas to facilitate restoration and resilience.

An analysis to close National Forest System roads to public use is outside the scope of this project. A decision identifying roads on the forest open to use by the public was completed in 2008 (ENF Public Wheeled Motorized Vehicle Management ROD) and allows highway legal and non-highway legal motor vehicle use by the public on 1,002 miles of Maintenance Level-2 native surfaced roads. In addition, Subpart A Travel Analysis is currently being completed at a 'forest scale'. The Forest is taking a broad look at the whole road system and the associated risks and benefits to users and resources across the Forest. The process will identify potential opportunities for changes to the road system. Inputs to the process include ecological, social, cultural and economic information. Subpart A findings will inform NEPA analysis in the future.

128. Comment (Commenter 11): The DEIS's attempt to justify refusing to fully consider one or more action alternatives is misleading. The reasons given on pp. 2-30 and 2-31 of the DEIS are misleading. For example, the first reason given is that, if hazard trees were not removed on Level 2 roads, then these trees would still remain a hazard on 162 miles of Level 2 roads that would remain "open to the public". Clearly, we have been requesting that these Level 2 roads be closed, as opposed to remaining open, with no hazard tree felling. This is well within the scope of the Forest Service's authority here, and is reasonable given the impacts of logging to Spotted Owls and Black-backed Woodpeckers, and NEPA requires full consideration and analysis of all reasonable alternatives.

Response: See response to Comment 126 and 127.

129. Comment (Commenter 11): The DEIS's attempt to justify refusing to fully consider one or more action alternatives is misleading. On p. 2-30, the DEIS claims that closing these Level 2 roads would not allow the Forest Service to reduce fuels, and reduce future fire intensity/severity, in these areas. However, the empirical, published scientific literature concludes that post-fire logging and artificial tree planting does not effectively reduce future fire intensity/severity, and only the Forest Service's fire/fuel *modeling* exercises (where the model assumptions are set by the Forest Service, but the outcome is not empirically tested) claim otherwise. Further, in the absence of post-fire logging and artificial planting, high-severity fire areas burn mostly at low- and moderate-severity when they reburn, in real-world studies of actual fire areas (van Wagtendonk et al. 2012, Figure 5) (as opposed to Forest Service modeling assumptions).

Response: Alternatives that do not remove hazard trees from roads to reduce the risk from falling dead, dying, and damaged trees to workers and forest visitors do not meet the purpose and need. Level 2 roads cover approximately 162 miles of the project area and provide main access routes to the area north of the Rubicon River, Big X Mountain and Poho Ridge.

As described on page 5 of the FEIS:

"Excessive large, woody fuel accumulation increases flame lengths and fireline intensity, affecting the ability to suppress the fire and the ultimate fire size. High snag numbers contribute to long-range spotting and pose a risk to firefighter safety. Therefore, the removal of dead trees in strategic fire management areas is presently needed to reduce the future volumes of snags and surface fuels, which limit the ability of firefighters to safely and effectively control wildfires and manage prescribed fires."

Recent Forest Service Experience in R5, while fighting fire in the American Fire (2013), the Chips Fire (2012), and the Willow Fire (2015) have shown that firefighting efforts are constrained and limited by down logs, snags, and heavy fuels where treatments to reduce fuels have not occurred after a previous wildfire. This can be compared with experiences on the Kyburz Fire (2013), Kyburz Fire (2015), the Saint Pauli Fire (2005), and the 2015 King Fire which have shown that when a wildfire runs into a previous burn area that has been salvage logged, planted, and maintained similar to the proposed King Fire Restoration Project and have facilitated direct firefighting tactics which are both more effective and safer for firefighters.

Conclusions in van Wagtendonk et al. (2012) are mischaracterized by the commenter as van Wagendonk et al. (2012) found that: the severity of the first fire tended to influence the severity of subsequent fires. For example, areas that initially burned with unchanged, low, or moderate severity resulted in predominately the same severities in the second fire. Areas that first burned at high severity reburned with a higher proportion of high severity, primarily due to a conversion to chaparral. At the landscape scale, this means that there would be an increase in chaparral as high severity patches are converted from their initial vegetation type. The Forest

Service does not propose to reforest moderate or low severity burn areas of the King Fire. Salvage treatments have been focused in areas that burned with at high severity, except for hazard tree removal and establishment of strategic fire management zones. Reforestations treatments are only proposed in areas with greater than 90th percentile basal area mortality without a nearby seed source. Conclusions in van Wagtendok et al. (2012) applying to low and moderate severity do not counter the need to actively manage areas of the fire that burned at high severity, but rather support the Forest Service in the decision to limit salvage in those areas.

130. Comment (Commenter 11): The DEIS (p. 2-31) also asserts that an alternative that would only remove road hazards along public roads (Levels 3-5) would not generate much revenue for the Forest Service's budget. This is not a legally valid rationale for rejecting full consideration and analysis of an action alternative, and by relying on this rationale the Forest Service has arbitrarily and capriciously narrowed the purpose and need, and thus illegally constricted the range of alternatives, in violation of NEPA and the APA.

Response: The commenter is referring to a discussion of an alternative that was considered but not analyzed in detail. The Hazard Tree Removal Only (Alternative B) would only cut and remove hazard trees on high-use roads maintained for public use (Level 3, 4, and 5 roads) or administrative facilities/infrastructure (campgrounds/buildings, etc.); all other dead trees would remain (FEIS, pg. 38). The commenter refers to one of the reasons this alternative was eliminated from detailed analysis, however generating funds to offset the cost of restoration activities was not the sole reason. As described in the FEIS, pg. 38 to 39, this alternative was eliminated from detailed analysis since it does not: 1) meet the purpose and need to reduce the risk from falling dead, dying, and damaged trees to workers and forest visitors since hazard trees would remain in most areas of the fire away from roads where people still recreate and work; 2) meet purpose and need to remove dead trees in strategic fire management area's to improve the agency's ability to manage and control future fires; 3) meet the purpose and need to actively manage severely burned areas to facilitate restoration and resilience including reforesting severely burned areas and removing dead trees that would fall and increase the likelihood of high-severity fire; 4) meet the purpose and need to balance active management with the retention of important attributes of post-fire habitat at the landscape scale and within treatment areas to support the diversity and abundance of species since virtually no active management would occur; and 5) meet the purpose and need to generate funds to offset the cost of restoration activities and contribute to societal needs.

131. Comment (Commenter 11): The DEIS's attempt to justify refusing to fully consider one or more action alternatives is misleading. Finally, the last rationale given (that foregoing large-scale logging deprives the Forest Service of the opportunity to study the effects of large-scale logging in a large intense fire area—see p. 2-31) is self-serving and arbitrary, given that the Forest Service has already studied, and is actively studying, this very thing in multiple large, intense fire areas, including Moonlight, Rim, and Chips. Given the extreme lack of large, intense fire areas that have not been extensively post-fire logged and artificially planted by the Forest Service, there is a far more pressing research need to determine how forest ecosystems respond in the absence of industrial forest management. We are especially troubled by the willingness of the Forest Service to attempt to use research to justify intensive post-fire logging in an area where California Spotted Owls are declining most steeply. This attempt is contrary to our experience with the Rim fire EIS litigation wherein we were attacked by the Forest Service for relying on research that did not (because it could not) examine the effects of wildfire in the absence of post-fire logging (e.g.,

Clark et al. 2013). Any research that occurs on the King fire will violate the Forest Service's own argument because it will not be capable of separating the effects of wildfire from logging given a) all of the DEIS' alternatives allow extensive post-fire logging in likely owl territories (within 1.5 km), and b) the logging in these alternatives is in addition to the already extensive post-fire logging occurring on private lands in or near owl territories.

Response: One of the purposes of this project is to "promote scientific research to increase knowledge regarding the effects of large fires on the environment, how to reduce the risk of future fires, and how to restore resilient forests after fires" (FEIS, pgs. xii and 5). The research that is occurring within the King Fire footprint will look at a range of areas that are untreated (unsalvaged and unplanted) to areas that are salvaged and planted. Results will improve our understanding of the effect of salvage on understory development and snag longevity. Results will also provide information about replanting patterns that could reduce maintenance costs while simultaneously improving stand resilience (FEIS, pg. 20). Other opportunities exist to research the nearly 50,000 acres that will remain untreated in this project.

132. Comment (Commenter 11): A supplemental DEIS is required to analyze significant new information that has rendered the 2004 Framework forest plan, under which this project is planned, outdated and inaccurate.

The 2004 Framework Has Been Rendered Inadequate and Obsolete by Significant New Information, and a Supplemental Environmental Impact Statement (SEIS), or a Sierra Nevada-wide Cumulative Effects EIS, Must Be Prepared Before Further Logging Projects May Proceed

The 2004 Framework forest plan was based upon several key assumptions and conclusions about forest ecology and management that have now been refuted or strongly challenged (and the weight of scientific evidence now indicates a different conclusion) by significant new scientific information, which requires a fundamental reevaluation of the plan under NEPA through a supplemental EIS. These issues are bioregional in nature, and are not particular to the analysis area in the EA; thus, the cumulative effects analysis in the DEIS cannot adequately analyze the impacts and cumulative effects of these issues, and a Sierra Nevada-wide EIS must be prepared to address this information and its implications for wildlife species that range throughout the Sierra Nevada mountains.

In addition, project-level supplementation would be required for any Environmental Assessment or Environmental Impact Statement that is issued pursuant to the 2004 Framework, and that is based upon the Framework's prescriptions and management assumptions/direction, as this project is.

Response: The referenced 2004 "Framework" is not an ongoing, agency action, as described in case law. Therefore, NEPA's supplementation regulations (40 CFR 1502.9(c)) do not apply to the 2004 Framework EIS; nor does NEPA require the agency to prepare a "Sierra Nevada-wide Cumulative Effects EIS." Even though the Forest Service is not required to prepare a supplemental EIS for the 2004 Framework based on new scientific information, the agency is responsible for considering new information at the project level, when such information is relevant to the project being considered. In this way, new science is addressed at the time and scale that is most relevant and practical.

The Forest Service recognizes that the state of scientific knowledge has changed since the 2004 Framework was issued and that forest plans should strive to remain consistent with the current

scientific understandings. However, it is not practical to supplement programmatic EISs and revise LRMPs every time new information arises; doing so would lead to an unending loop of programmatic planning, which is also described in case law. The National Forest Management Act (NFMA) recognized the need for stability in forest planning, and envisioned that LRMP Revision would only occur every 10-15 years. The 2004 Framework is approximately 10 years old, and the region has begun to revise the LRMPs for the Sierra Nevada National Forests, with the first three plan revisions expected to be completed in 2015. It would be impractical for the agency to prepare a new EIS for the 2004 Framework while the agency is devoting its resources to revising the plans covered by the 2004 Framework through the current LRMP revision process. Until the LRMP revisions are completed for the Sierra Nevada National Forests, new scientific information and changed circumstances can be addressed in the site-specific project context, when the new information or changed circumstances are relevant to the project being considered.

The FEIS reviewed and cited to information from the "Science synthesis to support socioecological resilience in the Sierra Nevada and southern Cascade Range" (Long and other 2014), which may address some concerns about assessing the current status of forest ecology and management. This general technical report included focal topics on forest and fire ecology; soils; aquatic ecosystems; forest carnivores including Pacific fisher, marten, and California spotted owl; air quality; and the social, economic, and cultural components of socioecological systems. For example, the project included information in the vegetation analysis (e.g. FEIS pg. 197, 204), terrestrial wildlife analysis (e.g. FEIS pg. 283, 298, and 300) and aquatic wildlife analysis (e.g. FEIS pg. 272).

Resilience, restoration, fuels, wildfire and natural range of variability aspects of forest ecology and management were also reviewed specifically for this project (FEIS Vol. 2 Appendix A, B, and C), which informed planning of recovery, reforestation, and restoration activities within the area (FEIS Vol. 2 Appendix B page 2). The intent was to use the resilience and restoration analysis in conjunction with the Appendix C's Fire Management Strategy within the King Fire, as well as management objectives for other forest resources, and public participation to develop proposed actions and alternatives.

Reforestation

133. Comment (Commenter 11): The DEIS's attempt to justify refusing to fully consider one or more action alternatives with much higher levels of protection for complex early seral forest from logging and artificial planting (DEIS, pp. 2-2 and 2-30), based on natural tree regeneration potential, is inaccurate and misleading. For example, the DEIS (p. 2-2) claims that Crotteau et al. (2013) found "dramatically lower regeneration rates" in high-severity fire areas than in low/moderate-severity areas in the Sierra Nevada. In reality, Crotteau et al. (2013, Table 4) found 733 conifer seedlings per hectare (297 per acre) in high-severity fire areas within mixed-conifer forests, and this included 189/hectare (77/acre) of ponderosa and sugar pine. In other words, there is substantial regeneration that occurs in high-severity burned areas, and the fact that more regeneration can occur in low or moderately burned areas is irrelevant. The citation to Bohlman (2014) (the correct citation in the References section is Bohlman and Safford 2014) is similarly misleading and inaccurate since this study was conducted in the Freds fire **after** nearly all of the high-severity fire areas had been heavily post-fire logged, and when only three small unlogged areas (a few dozen acres in size each) were left unlogged—none of which were nearly large enough to draw conclusions about natural conifer regeneration hundreds of meters into large high-severity fire patches in the absence of post-fire logging, which directly kills most of the

natural post-fire conifer regeneration (Donato et al. 2006). I (Dr. Hanson) am currently conducting natural post-fire conifer regeneration transects in the largest high-severity fire patches in the Rim fire of 2013, where no post-fire logging has yet occurred, and natural conifer regeneration in the interior of the largest high-severity fire patches (200 to more than 600 meters into patches) averages over 250/acre as of 2015, and is dominated by ponderosa pine and sugar pine, which are also the tallest conifer seedlings in most cases (i.e., they are growing faster than fir and cedar). Even at more than 1,000 meters into the interior of these largest high-severity fire patches, levels of natural post-fire conifer regeneration still exceed 150/acre on average (mostly pine). This creates ecologically important landscape-level heterogeneity (Donato et al. 2012, DellaSala et al. 2014).

Response: The Sierra Nevada Forest Plan Amendment Record of Decision (SNFPA ROD 2004) provides for ecosystem restoration following large, catastrophic disturbance events. Restoration activities may be conducted in all land allocations and include objectives for managing disturbed areas for long-term fuel profiles, restoring habitat, and recovering the economic value of some dead and dying trees. Restoration projects can include salvage of dead and dying trees for economic value as well as for fuels reduction (SNFPA ROD, p. 6). Alternatives described in the comment not analyzed in detail in the EIS did not meet one or more element of the purpose and need for the project.

The Forest Service's use of the terminology "deforested vegetation condition" is different than the dictionary definition of the term deforestation, which connotes a permanent change in land use. The term deforested vegetation condition describes a temporary condition of the forest vegetation after a wildfire has burned at such high severity that not enough trees were left alive for the forest to naturally regenerate and function normally. It is a signal that reforestation treatments are required to re-establish forest cover promptly. Conifer areas that had 90 percent or higher basal area mortality were considered to be in a deforested vegetation condition for the King Fire Project. The National Forest Management Act (NFMA) states that "It is the policy of the Congress that all forested lands in the National Forest System shall be maintained in appropriate forest cover with species of trees, degree of stocking, rate of growth and conditions of stand designed to secure the maximum benefits of multiple use sustained yield management in accordance with land management plans" which, as it pertains to fire, means to reforest where appropriate. The King Fire Resilience and Reforestation Strategy (Appendix B of the FEIS) identified where reforestation was an appropriate management action.

Planting trees is a way to ensure this policy is met in areas where seed sources are lacking, and ensuring a diverse multi-species forest becomes established in a timely manner. Natural regeneration within the project area is to be expected (Collins et al. 2010; Shatford et al. 2007). However, it may be highly variable within site specific locations and within different years post fire. Natural regeneration density may vary by seedlings per acre and/or species (Shatford et al. 2007). The analysis of damage to natural regeneration, where present within the project area is discussed in the FEIS on pg.107. Proposed treatment activities achieve a need to remove fire killed for long term management and safety. While proposed activities may negatively impact some advanced regeneration, the ability to safely, effectively and efficiently manage these stands into the future cannot be provided without management activities to reduce fuels and remove safety hazards.

Field experience from local silviculturists and culturists indicates that sites closest to the surviving seed source has the greatest capacity for natural regeneration. Furthermore, a body of scientific information indicates that distance to seed trees can be a limiting factor in seedling establishment within high severity areas of a fire. As discussed in the King Fire Resilience and Reforestation Strategy (FEIS Appendix B):

"The ability of forests to regenerate after stand replacing fire is highly dependent on seed sources. Larger patches can create openings larger than available seed from neighboring surviving conifers can reach (Bonnet et al. 2005) Areas that have experienced high severity fire have been shown to have dramatically lower regeneration rates for conifers and especially for pines compared to areas burned at moderate or low severity (Crotteau et al. 2012)…….Although post-fire seedling establishment is driven by a series of factors (e.g., available moisture, soil insolation, rodent herbivory, damping-off fungi) the foremost requirement for most natural conifer regeneration is a seed source (Bonnet et al. 2005)……Uncharacteristically large high severity patches, on the other hand, have such poor overstory survival that distance to seed source becomes a limiting factor (Bonnet et al. 2005). High-severity burns may be less likely to naturally reforest if the scale is sufficient to preclude seed-tree adjacency (Bohlman and Safford 2014). While some studies have not been able to associate tree regeneration patterns in stand replacing patches with patch characteristics (size, perimeter-to-area ratio, or distance to edge) seedling regeneration and especially pine regeneration are reduced in patches of high severity fire (Collins and Roller 2013)"

In particular the desired shade-intolerant species, such as pine, have diminished capacity for natural regeneration as the distance from the "edge" or seed source increases (McDonald 1983). This observation regarding shade tolerant versus shade-intolerant regeneration is echoed in a study in the Storrie Fire by Crotteau et al. (2013). Crotteau et al (2013) noted that white fir regeneration was dominant in high severity fire areas in the Storrie Fire, even in sites conducive to pine. The areas farther from seed sources, especially those large areas that burned at high severity may regenerate, but would take a longer period (potentially decades) and have more variable success in meeting desired stocking standards.

Furthermore, data in Crotteau et al (2013) is misrepresented by the commenter. As stated in Crotteau et al (2013):

"Although our study did not measure distance to the nearest seed-bearing trees, seed trees within the High-severity stratum were few and far between. Inconsistent presence of a seed source was likely the cause of low seedling densities after High severity burns in the study area; even though mean density within this burn severity was 715 seedlings ha-1, eight of the fifteen observational units had fewer than 247 seedlings ha-1."

The study by Donato et al. (2012) does suggest that post-fire/early-seral vegetation can support complex biodiversity. However, mid to late seral, open canopy forest vegetation is also important in terms of landscape diversity. In reforestation, managers can better control density, spacing and desired species versus solely relying on natural regeneration. Consequently a strategy reliant solely on natural regeneration does not insure timely achievement of desired conditions (density, species and arrangement) of forest cover.

134. Comment (Commenter 11): The DEIS does not meaningfully address the current state of scientific knowledge regarding the high complexity and biodiversity provided by unlogged/unplanted high-severity fire areas, and the comparatively low complexity in post-fire logged/planted areas that are promoted in the DEIS (including past examples, and tree plantations from past post-fire logging and planting) (Donato et al. 2012, DellaSala et al. 2014). For example, Donato et al. (2012) concluded, with regard to post-fire succession in high-severity fire areas:

> [W]e suggest that slow, sparse or suppressed tree establishment may actually accelerate the development of certain forms of spatial complexity that are typically associated only with late-successional forests (see Fig. 2). Low-density tree regeneration and competition with shrubs can function to thin out and stratify regenerating trees early on, replacing the conspecific exclusion phase, which is commonly expected to take ca. 100 yr after disturbance, with an interspecific exclusion phase that may transpire in the first ca. 30 yr. The resultant lower density of establishing trees – the eventual overstorey – may mean that overstorey canopy closure never occurs in such stands (see Fig. 1). Furthermore, because spatial features such as gaps, overstorey stem distribution and understorey presence are already established (rather than by new gap formation in >100-yr-old stands), a significant portion of eventual old-growth spatial pattern may already be determined in this early phase. This suggests that protracted overstorey establishment may not be a mere obstacle on the way to complex old-growth condition, as commonly viewed, but rather lead to important structural complexity much earlier.

The DEIS quite simply misses the key lessons of current forest and fire ecology on these points, and, by presenting a one-sided and skewed version of available data, improperly minimizes adverse impacts of logging by hiding and ignoring the importance of unlogged post-fire areas to current and future forest habitat.

Response: The National Forest Management Act (NFMA) sets policy to maintain appropriate forest cover in accordance with forest management. Planting trees is a way to ensure this policy is met in areas where seed sources are lacking, and ensuring a diverse multi-species forest becomes established in a timely manner. The King Fire Resilience and Reforestation Strategy (Appendix B of the FEIS) identified where reforestation was an appropriate management action. Conifer seeds are not naturally dispersed long distances so conifer tree planting would ensure a variety of native conifer tree seedlings would be re-established in severely burned areas. Replanting severely burned areas with ecologically appropriate species would ensure timely replacement of burned conifer forest stands and improve tree species composition. The intent for planting trees is guided by these policies and the goals of moving the burned landscape toward desired conditions in the Forest Plan.

Swanson et al. 2011 suggests that "maintenance of areas of naturally developing early successional forest ecosystems as part of a diverse landscape… should be 'in reasonable proportion to historical occurrences of different successional stages' as based on region-specific historical ecology". Early seral post-fire habitats are just one component of a complex temporal landscape. Recent research has documented the importance of within and between stand heterogeneity that represents all seral stages and maximizes the presence of numerous species (White et al. 2013). Late successional habitats dominated by conifer trees are also an important successional stage. This seral stage evolved with low to moderate intensity fire and has a limited capacity to recover after stand replacing events due to limited natural regeneration and extensive shrub cover (Collins and Roller 2013). As a result, once conifer forests may be converting to new vegetation assemblages following high severity fire (Perry et al. 2011).

The 2004 FSEIS ROD provides management guidelines for disturbance events such as wildfires including recovering the economic value of timber killed or injured by the "disturbance" (wildfire), re-establishing forested conditions and managing the development of fuel profiles over time. These guidelines include the recommendation to "…generally …not conduct salvage harvest in at least 10 percent of the total area affected by fire." (USDA 2004, pg. 52). The most extensive treatment analyzed in the EIS includes treatment of up to 50% of the Mixed Conifer Forest type that burned at high severity (greater than 90% basal area loss) while the proposed

action proposes to treat approximately 40% of this forest type, with additional untreated areas retaining between 10 to 15 percent of the area dispersed within the proposed treatment units.

Perry, D., P. F. Hessburg, C. N. Skinner, T. A. Spies, S. Scott, A. H. Taylor, J. F. Franklin, B. McComb, and G. Riegel. 2011. The ecology of mixed fire severity regimes in Washington, Oregon, and Northern California. Forest Ecology and Management 262:703-717.

Swanson, M. E., Franklin, J. F., Beschta, R. L., Crisafulli, C. M., DellaSala, D. A., Hutto, R. L., Lindenmayer, D., and Swanson, F. J. 2011. The forgotten stage of forest succession: earlysuccessional ecosystems on forest sites. Frontiers Ecology & Environment 9:117-125.

White AM, Zipkin EF, Manley PN, Schlesinger MD (2013) Conservation of Avian Diversity in the Sierra Nevada: Moving beyond a Single-Species Management Focus. PLoS ONE 8(5): e63088. doi:10.1371/journal.pone.0063088

135. Comment (Commenter 11): The Forest Service's often asserted assumption that higher-intensity fire areas will not naturally regenerate with conifers is directly contradicted by the Forest Service's own data regarding natural post-fire conifer regeneration in large high-intensity fire patches (Collins et al.2010). Specifically, the Forest Service found vigorous natural post-fire forest regeneration, dominated mostly by pines and oaks for trees over 1 centimeter in diameter at breast height (Collins et al. 2010, Table 5), and hundreds of trees per acre overall, within several years to about a decade after high-intensity fire, even where native shrub cover was 90-100% (Collins et al. 2010, Tables 5 and 6). This is consistent with findings from other studies (Shatford et al.2007).

Response: Natural regeneration within the project area is to be expected (Collins et al. 2010; Shatford et al. 2007). However, it is expected to be highly variable within site specific locations and within different years post fire. Natural regeneration density may vary by seedlings per acre and/or species (Shatford et al. 2007). Replanting severely burned areas with ecologically appropriate species would ensure timely replacement of burned conifer forest stands and improve tree species composition. Our intent for planting trees is guided by these policies and the goals of moving the burned landscape toward desired conditions in the Forest Plan

Field experience from local silviculturists and culturists that sites closest to the surviving seed source has the greatest capacity for natural regeneration. Furthermore, a body of scientific information indicates that distance to seed trees can be a limiting factor in seedling establishment within high severity areas of a fire. As discussed in the King Fire Resilience and Reforestation Strategy (FEIS Appendix B).

The King Fire Restoration Project reforestation design criteria take into account the findings by Collins et al. (2010) and have been designed with a variable approach to achieve the desired future forested conditions and meet NFMA direction, including variable spacing, cluster planting, and planting a mixture of conifer species. Desired species appropriate for the native ecological forest type would be planted such as ponderosa pine, Jeffrey pine, Douglas-fir, rust resistant sugar pine and incense cedar. Species mixes would be dependent on elevation, aspect and seed availability. Of particular concern is that shade-intolerant species such as pine have diminished capacity for natural regeneration the farther the distance from the "edge" or seed source increases (McDonald 1983). This observation regarding shade tolerant versus shade-intolerant regeneration is echoed in a study in the Storrie Fire by Crotteau et al. (2013). Crotteau et al (2013) noted that white fir regeneration was dominant in high severity fire areas in the Storrie Fire, even in sites conducive to pine. The areas farther from seed sources, especially those large areas that burned at high severity may regenerate, but would take a longer period (potentially decades) and have more variable success in meeting desired stocking standards.

A primary planting technique identified for the project is cluster planting. Cluster planting is meant to mimic natural stand heterogeneity, provide space for any natural regeneration that may occur while providing managers control over species composition, density and spacing. Cluster planting is also designed to establish stocking of desired species appropriate for the native ecological forest type at a density high enough to meet desired stocking levels, but low enough to create desired open canopied forested stands that compliment any natural regeneration that may occur. Considering the fact that naturally occurring regeneration may be damaged by salvage harvest operations (Donato 2006) under the proposed action, reforestation would utilize a wide spaced low density cluster planting design that would establish trees in locations where logging operations may damage seedlings.

A study by Donato (2009) appears to indicate a robust hardwood and shrub regeneration response after fires. Again, this is an important habitat component. The cluster arrangement is also designed to be consistent with natural hardwood and shrub regeneration. The wide spacing patterns (approximately 21-33 feet between clusters) is congruent with variable seedling survival to produce a planting that mimics the heterogeneity and pattern of a naturally occurring open canopied forest as well as allows space for shrub and hardwood natural regeneration.

136. Comment (Commenter 11): While a more recent report from Collins and Roller (2013) claims to find little natural conifer regeneration in many high-severity fire areas, this data actually supports the conclusion that logging, not fire, is what hinders regeneration. In that study, nearly half of the area surveyed had been subjected to intensive post-fire logging, which damages soils and removes or destroys natural seed sources, and most of the other areas had been clearcut prior to the fires (which we discovered using pre-fire remote sensing data), or were naturally non-conifer forest, e.g., black oak. The results of Collins et al. (2010 [Table 5]), which found and reported substantial natural conifer regeneration—especially ponderosa/Jeffrey pine and sugar pine—in high-intensity fire patches, excluded salvage logged areas, unlike Collins and Roller (2013). Collins et al. (2010) state that "some areas within each of these fires experienced post-fire management, ranging from post fire salvage logging, tree release and weed management. These areas were removed from analysis." Specifically, Collins et al. (2010 [Table 5]) found 158 ponderosa pine and sugar pine conifers per acre regenerating in high-intensity fire patches in the Storrie fire—68% of the total natural conifer regeneration by species. Extensive natural conifer regeneration surveys deeper into the Storrie fire, at seven years post-fire, revealed abundant natural conifer regeneration, especially pine (Hanson 2007b [Tables 1 through 4, and Appendix A]). In addition, over 95% of the conifer regeneration in Collins et al. (2010) and Collins and Roller (2013) was under 0.1 cm in diameter at breast height (Collins et al. 2010); the plots used to determine the density of conifers of this size covered only 9 square meters of area per plot, and many high-intensity fire patches in the study only had 3-5 plots for an entire high-intensity fire patch (Collins and Roller 2013). This means that, even if 200-300 naturally-regenerating conifers per hectare actually existed in a given high-intensity fire patch, the methods used by Collins and Roller (2013) would be very unlikely to detect conifers, as a matter of basic math and probability. Further, Collins and Roller (2013) did not gather data on the pre-fire stand composition by conifer species, so they have no basis to suggest that post-fire pine regeneration is less than the pre-fire proportion. In addition, we analyzed the plots selected by Collins and Roller (2013), using Google Earth imagery, and found that most had been subjected to pre-fire clearcutting, which removed the seed sources, or were pure black oak (with no pre-fire conifers), and these facts were not disclosed by Collins and Roller (2013).

Response: The assumption by the commenter that salvage logging is the reason for lack of successful pine regeneration found in Collins and Roller (2013) is not supported by the results of the study as both salvaged and unsalvaged areas generally had no pine regeneration. "*Plots*

*that were salvage-harvested alone or were not treated had, for the most part, zero pine regeneration, with a few outliers" (*Collins and Roller, 2013).

Only 40 percent of the plots were either salvage-logged only or salvage-logged and planted (112 plots out of 277) total. This is clearly stated in the text of the article (Page 1804, right column). Note that contrary to the claim above regarding the removal of the "conifer seed source", findings indicated the highest conifer regeneration densities were in areas that were salvage-harvested only and salvage-harvested and planted (see Figure 6).

The authors had a total of 277 plots across five fires. They opted for small, less intensive plots to cover a broader study area. This sampling approach stood up to intensive peer review in a respectable scientific journal, as is the standard for good science. Regarding the number of plots per high severity patch sampled, the range was 2-70 plots/patch, with a mean of 11 plots.

Regarding alleged discrepancies between Collins et al. (2010) and Collins and Roller (2013), the two used the same dataset. The preliminary findings reported in Collins et al. (2010, Table 5) are augmented by more in-depth analysis of the same data in (Collins and Roller 2013). Collins et al. (2010) only summarized tree regeneration data by the specific fire sampled, and in doing so, simply averaged all plots within a given fire to generate a single value for each species. Collins and Roller (2013) performed considerable analysis using the full distribution of the same dataset, rather than a single average value for each fire (Collins, per com. 2015). For example, there are individual plots in which conifer regeneration densities exceeded 10,000 per ha (see Figure 6 in Collins and Roller [2013]). In contrast, approximately 80% of plots had no conifer regeneration (see Figure 3 in Collins and Roller [2013]). When averaged out across an entire fire the very high densities, which occurred over a very small proportion of area, skewed values considerably, emphasizing the danger in only reporting averages. As a result, the findings presented in Collins and Roller (2013) represent a much more comprehensive presentation of tree regeneration in the areas sampled.

The claim above that areas sampled by Collins and Roller were largely "clearcut" prior to the fire is incorrect (Collins per com, 2015). Below is the breakdown for number of plots sampled in the Collins and Roller study by California Wildlife Habitat Relationships (CWHR) size class. This was based on the 1997 CalVeg update. Over 75% of plots were size class 4 or higher, which is indicative of fairly mature forests that were not subjected to any recent (last 50-80 yrs) even-aged silviculture (clearcut, to use the terms in the comment). Note, CWHR size class was used as a predictor variable to attempt to explain observed conifer regeneration densities and was not identified as having statistically significant relationship with observed regeneration.

CWHR size class	Number of plots
0	11
1	4
3	53
4	105
5	90
6	14
Grand Total	**277**

137. Comment (Commenter 11): The DEIS's reliance on the assumption that higher shrub cover precludes natural conifer regeneration, is also false given that Collins and Roller (2013) found that areas with shrub cover of at least 25% tended to have higher conifer regeneration in high-

severity fire patches (see second paragraph of Results). The fact that (in the second to last page of the Discussion) Collins and Roller (2013) speculate that shrub cover impedes natural conifer regeneration simply indicates the authors' bias, given that the results do not support their statement whatsoever. This fallacy of the notion that high shrub cover precludes natural conifer regeneration is further demonstrated by Crotteau et al. (2013), Table 4, which shows that there were over 700 stems per hectare despite the fact that over 60% of them were overtopped by shrubs. Shatford et al. (2007) also found that shrub cover did not preclude substantial natural conifer regeneration in highseverity fire patches.

Response: There is no assumption in the FEIS that higher shrub cover precludes natural conifer regeneration contrary to the commenter's assertion. The limitation of natural regeneration to establish a reliable stand structure and species composition is described in the FEIS on pages 203 to 205. Furthermore, experience recent fires the Eldorado National Forest and the neighboring Tahoe National Forest indicate limited ability to achieve desired species composition and stand development where shrubs are dominant. As described in both the FEIS analysis and in Collins and Roller 2013, high levels of shrubs competition can favor non-pine species within stands.

As described on page 205 of the FEIS:

> *"In areas where shrub development is rapid, shade tolerant trees and shrubs will likely be the dominant vegetation types into the future. Tall shrubs tend to create a competitive environment that favors shade tolerant conifer species, such as white fir and incense cedar. These species can sometimes persist in a shrub understory until eventually overtopping the shrubs. Shade intolerant species, such as ponderosa pine, and partially shade intolerant species, such as sugar pine, are also capable of seeding into sites at the stand initiation phase, but competition with shrubs can create an unfavorable environment (Gray et al. 2005; Plamboeck et al. 2008)."*

This analysis is consistent with results from Collins and Roller (2013) identified by the commenter:

> *"The regression tree analysis at the patch level identified shrub cover as the only significant predictor of both non-pine conifer and hardwood regeneration density (results not shown). For both species groups, average regeneration density tended to be higher in patches with average shrub cover over 25 %. The same analysis failed to identify any significant variables explaining the variability in pine regeneration density at the patch level. It is likely that this lack of significant explanatory variables is driven by the absence of pine regeneration on such a high number of patches."*

Replanting severely burned areas with ecologically appropriate species would ensure timely replacement of burned conifer forest stands and improve tree species composition. Our intent for planting trees is guided by these policies and the goals of moving the burned landscape toward desired conditions in the Forest Plan.

Soils

138. Comment (Commenter 11): The DEIS does not adequately disclose the fact that post-fire logging tends to increase chronic sedimentation and erosion to streams (Wagenbrenner et al. 2015).

Response: The FEIS discusses on pages 189, 191, 232, and 239 that post-fire logging can increase erosion and sediment delivery to streams. Wagenbrenner *et al* (2015) was cited in the

FEIS on page 190 (see excerpt below) and referenced their conclusions that salvage logging may increase erosion and sedimentation.

Although hillslope erosion is likely to be reduced, there may be increased erosion from skid trails and landings. The complexity of logging following a fire was summarized in a recent paper by Wagenbrenner et al. (2015). The effects were dependent on the compaction, soil cover, water repellency, and vegetative regrowth. They found that sites that used a feller buncher and skidders had 10-100 times the sediment production than those sites that were not logged, whereas sites that were only feller buncher logged produced only 10-30 percent of the sediment as the skidder plots. Adding slash to the skid trails reduced the sediment production by 5-50 times over untreated skid trails.

The FEIS discusses "Erosion and Sedimentation" under the "Potential Effects of Proposed Activities", "Water Quality" section on page 232. Additionally, The following is an excerpt from the DEIS, "Direct and Indirect Effects of Alternative 2 (Proposed Action)", "Water Quality", "Erosion and Sedimentation" section on page 239.

Short-term ground disturbance such as compaction and displacement would occur under Alternative 2 with use of heavy equipment. Previous research has demonstrated that salvage logging can increase sediment routing to streams due to construction and use of skid trails and landings as well as use of heavy machinery to cut and remove trees. Increased sediment delivery to streams as a result of salvage logging can increase stream turbidity, which can impact the beneficial uses of water (see analysis of Riparian Conservation Objectives, Appendix I).

The following statement from page 191 of the FEIS discloses the uncertainty of the effect of salvage logging as it pertains to erosion.

In summary, there is much uncertainty regarding the effects proposed activities will have on soil cover and erosion. Modeling for Erosion Hazard Rating showed substantial improvements with the prescribed design criteria, but research on post-fire logging resulting in erosion is limited (McIver and Starr 2001) and is not consistent. Although erosion may increase as a result of salvage activities, the magnitude, as Chou (1994) suggests, is likely overwhelmed by the erosion and sedimentation resulting from the fire itself. What is clear from both research and modeling is that most of the analysis area will remain below minimum threshold values for effective soil cover and will continue to exceed soil stability thresholds.

The Forest took into account the greater impacts observed by Wagenbrenner *et al* (2015) when developing aggressive design criteria to rehabilitate disturbances, setting minimum post operation soil cover requirements, and developing treatments in Watershed Sensitive Areas where erosion was predicted to be the greatest.

139. Comment (Commenter 11): The DEIS (p. 3-176) misrepresents the existing conditions in the King fire area by claiming that the high-severity fire areas are largely devoid of ground cover. There is no way that anyone who has walked through these areas recently could honestly make this claim; we have found on our repeated site visits in 2015 that there is abundant ground cover in the high-severity fire areas—needles, shrubs, conifer and oak regeneration, grasses, and wildflowers (see sample photos in attached photo file). Even in the great majority of areas of true crown fire, where needles were consumed, there is vigorous new growth of grasses, wildflowers, shrubs, oaks, and some conifer seedlings (see photo attachment). The claim that high-severity fire areas are dominated by bare ground is a myth, and Forest Service staff are well aware of this, having spent time in these high-severity fire areas in the spring of 2015. The photo on p. 3-177 of the DEIS is not representative of conditions in high-severity fire areas of the King fire since the spring of 2015 (i.e., current conditions).

Response: The DEIS states "*In areas that burned at high severity, all or nearly all soil organic matter and soil cover was consumed, which resulted in extensive areas of bare ground highly susceptible to erosion. As most if not all leaves and pine needles were consumed, there is no potential for future groundcover from needles and leaves falling to the ground (referred to as "needle cast"). (DEIS pg. 3-176 and FEIS pg. 228).*

This statement represents the conditions resulting from the fire in the drainages that burned at high severity. These conditions and the precipitation events discussed in the same paragraph form the setting for the existing condition of the post-fire hydrologic condition. Clearly vegetation is recovering, however, recovery is not uniform (see response to Comment 125).

The commenter is correct that some areas of high burn severity maintained scorched needles that are providing soil cover. This was accounted for in the soil section analysis regarding existing soil cover and consequently, the analysis of Erosion Hazard Rating. Generally, areas with high needlecast potential did not rate as 'High' Erosion Hazard Rating. High resolution satellite imagery was used to determine areas where needlecast is providing soil cover and is illustrated in image 1 below.

Where red indicates live needles, brown indicates retained but scorched needles, and black lines are trees where all needles were incinerated. Much of the high soil burn severity resembles the image below of a portion of the Rubicon River canyon.

Image 2 illustrates the degree to which needlecast was incinerated in the Rubicon River canyon. The Rubicon River is in the bottom of the image and 11-Pines Road is in the upper portion of the image. It is evident that all needles were completely burned across large sections of the Rubicon Canyon (black lines) but that scorched needles are likely providing ground cover to some degree in patches of "brown" areas.

The FEIS page 228 was changed to state: In areas where leaves and pine needles were consumed, there is no potential for future groundcover from needles and leaves falling to the ground (referred to as "needle cast").

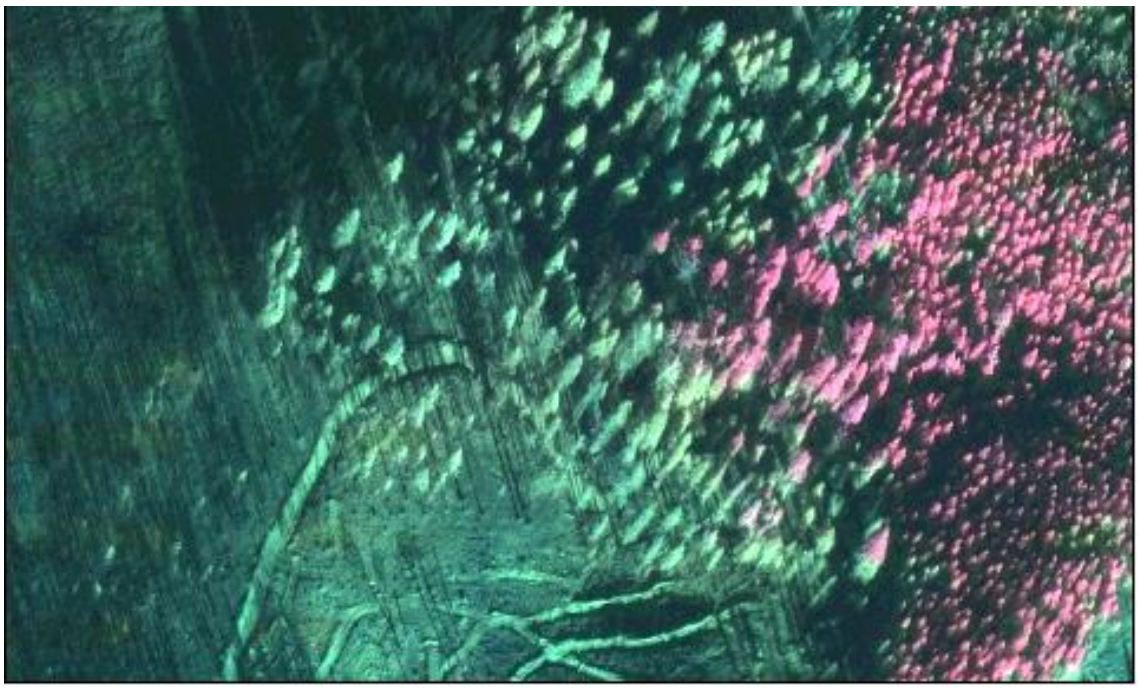


Image 1. High resolution satellite imagery (black lines=burned trees with no remaining needles, brown trees=burned trees with dead needles, and red trees=unburned trees with healthy, live needles).

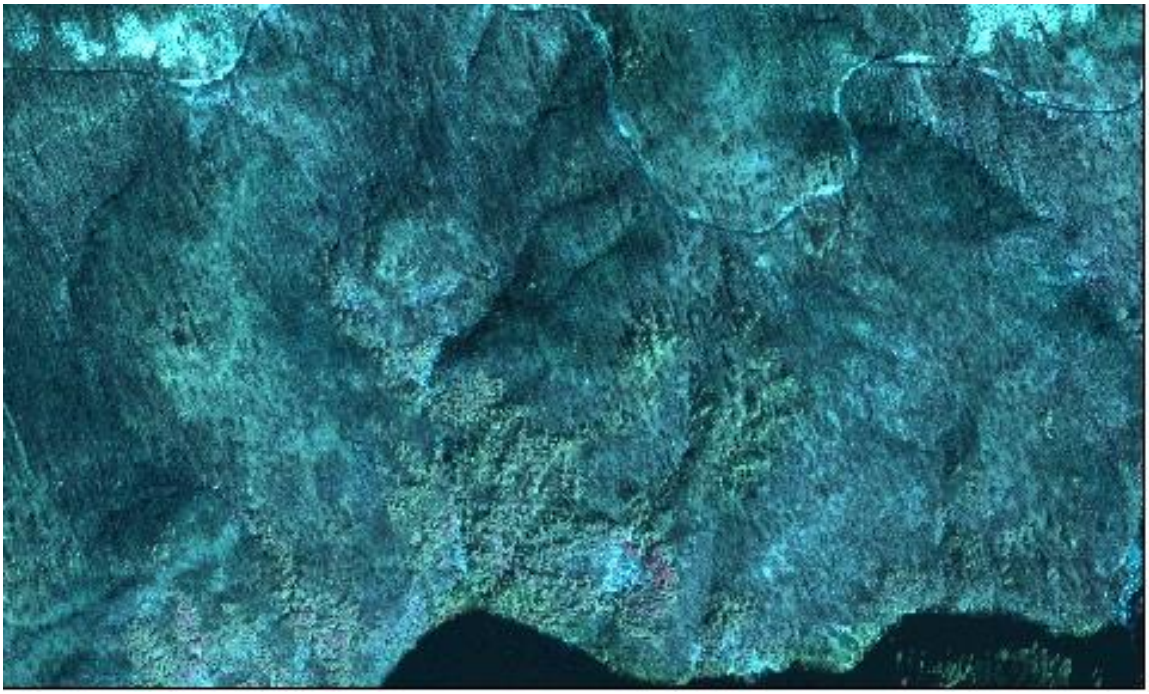


Image 2. Portion of Rubicon River Canyon. Note complete incineration of needles in most of the area with burned needle retention in patches of trees.

Vegetation

140. Comment (Commenter 11): The DEIS does not adequately disclose that most studies have found substantial natural post-fire conifer regeneration in large high-intensity fire patches (Donato et al. 2006, Shatford et al. 2007, Crotteau et al. 2013). Moreover, the DEIS does not adequately disclose the fact that substantial existing natural conifer regeneration is occurring currently in the large high-intensity fire patches—including deep into large patches—as we have found on our site visits (see sample photos in attached photo file).

Response: A critical need for the King Fire Restoration project is to re-establish forest conditions and habitat in burned forest stands. To accomplish this need, the Forest Service is relying on a combination of natural regeneration and tree planting. The King Fire Resilience and Reforestation Strategy (Appendix B of the FEIS) identified areas where natural regeneration was most likely to result in adequate reforestation and the majority of these areas were excluded from the proposed activities. Re-establishing forest conditions requires an active management approach (site preparation, conifer tree planting, and release of the established seedlings from competing shrubs) in specific areas to achieve this objective in a timely manner as natural regeneration can be quite varied and may not meet management objectives. Areas proposed for planting were identified based on Forest Service silviculturists' knowledge and experience with past fires on the Eldorado National Forest (including needs for planting following salvage harvest activities), further informed by site-specific observations in the King

Fire area. The King Fire Project's approaches for tree planting designs are based on research findings and our experience with post-fire salvage and reforestation activities on the Forest.

Crotteau et al. (2014) found the lowest overall seedling densities and poorest conifer stocking were observed in the high-severity burned areas. Additionally a study of tree regeneration patterns and shrub dynamics for stand-replacing patches within five recent fires in the northern Sierra Nevada, including the Storrie fire, found that although tree regeneration densities varied considerably, over 50 percent of the sampled stand-replacing patches and approximately 80 percent of all plots had no tree regeneration. The percentage of patches and plots without pine regeneration was even higher, 72 percent and 87 percent respectively (Collins et al. 2010)."

Under the most extensive alternative, approximately half of the mixed conifer forest type that burned at greater than 90 percent basal area mortality would be left to regenerate naturally under the proposed action. Additionally, in areas of low and moderate vegetation burn severity, natural regeneration would become established over time. These portions of the salvage harvest treatment areas would not be planted and seeding from nearby live ponderosa pine, sugar pine, white fir, and Douglas fir would occur in these areas. In addition, sprouting of native oaks would occur throughout the treatment areas.

While the commenter stated they found abundant natural regeneration, they did not provide any geographic information to aid the FS in locating such areas, making field confirmation of such information impossible. On recent visits to the entire King Fire Restoration Project, very little natural regeneration was seen, and none was seen in the interior of the high intensity burn areas.

Wildlife

141. Comment (Commenter 11): None of the alternatives protect what the severely declining spotted owl population, and none of them seek to ensure the well-being of post-fire obligates like the black-backed woodpecker, especially in light of the substantial private lands logging that has already occurred and is still ongoing (see, e.g., attached photo exhibit).

Response: Based on the seven significant issues identified as a result of public scoping (FEIS, pgs. xiii and 7 to 8), the Forest Service developed three alternative proposals that achieve the purpose and need differently than the proposed action (FEIS, Chapter 2). Two of the significant issues were specific to California spotted owl (Issue 1) and black-backed woodpecker (Issue 5). Alternative 3 was designed to address these issues by retaining greater amounts of post-fire habitat for species that utilize complex early-seral forest and early-seral shrub habitats and limits salvage and reforestation activities where post-fire conditions are within the natural range of variation. Longer-term natural regeneration is emphasized over more rapid reforestation to reduce the area affected by mastication, replanting, and removal of competing shrubs and grasses and heterogeneity and resilience are reinforces through early introduction of prescribed fire. (FEIS, pg. 22)

142. Comment (Commenter 11): The 2004 Framework FEIS (pp. S-15, 138, 243, and 246) assumed that mixed-severity fire, including higher-severity fire patches, was a primary threat to Pacific fishers, and the Framework FEIS (p. 242) did not include density of small/medium-sized trees among the important factors in its assessment of impacts to fishers. The U.S. Fish and Wildlife Service, in the fall of 2014, proposed to list the southern Sierra Nevada population of Pacific fishers as Threatened under the Endangered Species Act.
The data indicate that one of the top factors predicting fisher occupancy is a very high density of small/medium-sized trees, including areas dominated by fir and cedar, and that Pacific fishers may benefit from some mixed-severity fire.

Garner, J.D. 2013. Selection of disturbed habitat by fishers (*Martes pennanti*) in the Sierra National Forest. Master's Thesis, Humboldt State University. ***(Fishers actively avoided mechanically thinned areas when the scale of observation was sufficiently precise to determine stand-scale patterns of selection and avoidance—generally less than 200 meters).***

Hanson, C.T. 2013. Pacific fisher habitat use of a heterogeneous post-fire and unburned landscape in the southern Sierra Nevada, California, USA. The Open Forest Science Journal 6: 24-30. ***(Areas used by Pacific fishers in fire areas have a significantly higher proportion of higher-severity fire (50-100% basal area mortality) within a 500 meter radius than random locations along survey transects within fires. Pacific fishers are using pre-fire mature/old forest that experienced moderate/high-severity fire at about the same levels as they are using unburned mature/old forest. When fishers are near fire perimeters, they strongly select the burned side of the fire edge.)***

Hanson, C.T. 2015. Use of higher-severity fire areas by female Pacific fishers on the Kern Plateau, Sierra Nevada, California, USA. The Wildlife Society Bulletin (in press). ***(Using a Pacific fisher scat-detection approach, the current hypothesis among land managers that fishers will avoid higher-intensity fire areas was rejected, and fishers used unlogged higher-intensity fire areas at levels comparable to use of unburned dense, mature/old forest. Female fishers demonstrated a significant selection in favor of the large, intense McNally fire over adjacent unburned mature/old forest, and the highest frequency of female fisher scat detection was over 250 meters into the interior of the largest higher-intensity fire patch (over 12,000 acres).***

Underwood, E.C., J.H. Viers, J.F. Quinn, and M. North. 2010. Using topography to meet wildlife and fuels treatment objectives in fire-suppressed landscapes. Environmental Management 46: 809-819. ***(Fishers are selecting the densest forest, dominated by fir and cedar, with the highest densities of small and medium-sized trees, and the highest snag levels.)***

Zielinski, W.J., R.L. Truex, J.R. Dunk, and T. Gaman. 2006. Using forest inventory data to assess fisher resting habitat suitability in California. Ecological Applications 16: 1010-1025. ***(The two most important factors associated with fisher rest sites are high canopy cover and high densities of small and medium-sized trees less than 50 cm in diameter [Tables 1 and 3].)***

Zielinski, W.J., J.A. Baldwin, R.L. Truex, J.M. Tucker, and P.A. Flebbe. 2013. Estimating trend in occupancy for the southern Sierra fisher (*Martes pennanti*) population. Journal of Fish and Wildlife Management 4: 1-17. ***(The authors investigated fisher occupancy in three subpopulations of the southern Sierra Nevada fisher population: the western slope of Sierra National Forest; the Greenhorn mountains area of southwestern Sequoia National Forest; and the Kern Plateau of southeastern Sequoia National Forest area, using baited track-plate stations. The Kern Plateau area is predominantly post-fire habitat [mostly unaffected by salvage logging] from several large fires occurring since 2000, including the Manter fire of 2000 and the McNally fire of 2002. The baited track-plate stations used for the study included these fire areas [Fig. 2]. Mean annual fisher occupancy at detection stations was lower on Sierra National Forest than on the Kern Plateau. Occupancy was trending downward on Sierra National Forest, and upward on the Kern Plateau, though***

neither was statistically significant, possibly due to a small data set.)

Response: The FEIS discusses the project in terms of Fisher in chapter 3, page 294. Fisher are currently absent from the Central Sierra Nevada, including the King Fire project area. The King Fire project area is not within a typical dispersal distance of the closest known populations. For example, in the Cascade Range in southern Oregon, the average dispersal distance of juvenile males was 29-km, and maximum dispersal was 55-km (Aubrey and Raley 2006); thus, fisher are not assumed to occur in the project area. Prior to the King Fire the Rubicon Canyon provided a large, relatively contiguous area of mature conifer forest which may have been capable of supporting fisher. Fisher habitat is currently absent from the large high-severity fire portion of the Rubicon Canyon, but may remain in the portion burned at lower and mixed severity. Fisher have been absent from this portion of their historic range for at least several decades, however.

Aubrey, K.B., and C.M.Raley. 2006.Ecological characteristics of fishers (Martes pennanti) in the Southern Oregon Cascade Range.USDA Forest Service, Pacific Northwest Research Station, Olympia, Washington, USA.

California Spotted Owl (CSO)

143. Comment (Commenter 11): Most of the proposed logging along maintenance 1 or 2 level roads is not necessary, especially any logging of such roads in order to support additional commercial extraction and removal of large live and mature trees. The additional, and unnecessary, impacts of this to California Spotted Owls and Black-backed Woodpeckers, and other birds associated with complex early seral forest, are especially troubling in light of the fact that **82% of the proposed roadside logging** is along maintenance level 1 and 2 roads (**163 miles of roadside logging along level 1 and 2 roads**, specifically—amounting to over 5,500 acres of additional harmful logging; see pp. xvii through xviii). For example, Table 3W-T.14 of the DEIS shows that 18 Spotted Owl Protected Activity Centers—which are located within a Spotted Owl Area of Concern where California Spotted Owls are declining more steeply than anywhere else in their range—would have an average of 13% (and as much as 28%) logged in these nest/roost cores from **roadside hazard tree** logging, the great majority of which is on Level 1 and 2 roads that are not maintained for general public use. Table 3W-T.15 shows that, at what the DEIS calls the territory scale (0.7-mile radius around nest/roost site), many territories would have between one-third and two-thirds of the foraging habitat removed by post-fire logging and roadside hazard tree logging—much of it from roadside hazard tree logging along Level 1 and 2 roads; and Table 3W-T.16 shows that about 43% of the overall logging in owl territories is from roadside hazard tree logging (an average of 113 acres of logging in 22 territories, for a total of 2,486 acres, with 1,072 acres of this, or 43%, from roadside logging)—most of which is Level 1 and 2. This is a completely unnecessary and unjustifiable impact in light of the alarming decline of California Spotted Owl populations (Bond and Hanson 2014 [CSO ESA Listing Petition]; Tempel et al. 2014; Connor et al. 2013), and the relationship of that decline to post-fire logging or the combined effect of fire and post-fire logging (Lee et al. 2012, Clark et al. 2013, Lee et al. 2013). This sort of unnecessary and extensive post-fire logging of Spotted Owl territories—particularly in an Area of Concern with steep population declines mostly from past logging and post-fire logging (see Bond and Hanson 2014 [CSO ESA Petition])—will threaten owl populations and create a trend toward listing of the owl under the ESA, and this could be greatly mitigated if the Forest Service fully analyzed, and chose, an action alternative that avoided these impacts by keeping Level 1 roads closed and by closing Level 2 roads instead of logging them in owl territories.

Response: Roadside hazard tree removal is proposed for implementation across roads that are open to the public in the project area, including within spotted owl Protected Activity Centers (PACs), because it is necessary to mitigate hazards to the public and workers and allow for restoration of severely burned areas, and establishment of future forests (FEIS pages 4 to 5). Hazards to people working, driving, and recreating in the fire area include dead or dying trees, dead parts of live trees, or unstable live trees (due to structural defects or other factors) that are within striking distance of people or property. Hazard trees have the potential to cause property damage, personal injury, or fatality in the event of a failure. The public, private landowners, and forest workers are at risk from fire-killed trees along these roads and trails that deteriorate, become unstable, and eventually fall (FEIS Chapter 3 page 168 to 169). This activity is essentially to public and worker safety, however project design criteria have been developed to minimize the amount of habitat alteration that would occur in PACs from roadside hazard tree removal. Only fire-killed trees identified as imminent hazards would be removed, and a wildlife biologist would review trees marked for felling in post-fire PACs to ensure that hazard tree removal occurs judiciously and avoids high value wildlife trees wherever possible. Along ML 1 and 2 roads bisecting PACs, felled hazard trees in the largest size available (> 15" dbh and >20' long) would be left on the ground unless fuel loading is documented to exceed 15 tons per acre (DEIS Chapter 2 page 28). Since most of the acreage mapped in post-fire PACs remains unburned, or was burned at low severity, the need for removal of substantial numbers of roadside hazard trees from PACs is not anticipated. The action is therefore expected to have more minor effects on post-fire PAC habitat than elsewhere, as further described in the Terrestrial Wildlife BE.

ML 2 roads are open to the public and, as described in the FEIS, Chapter 1 public safety is an important component of the purpose and need for the project. The relationship of spotted owl decline to post-fire logging or the combined effect of fire and post-fire logging remain uncertain. The authors of Clark et al. (2013) made it clear that owl declines could not be attributed to any one factor from variables that included wildfire, savage logging, and past timber harvest. The authors of Lee et al. 2012 were unable to include post-fire logging as a covariate in the study, and Lee et al. 2013 found no statistically significant effects of fire or logging on occupancy dynamics, though they "found some evidence that fire and logging effects could be biologically meaningful." These studies do not support a conclusion that there is a relationship between owl population declines and post-fire logging.

144. Comment (Commenter 11): The DEIS acknowledges that (a) high-severity fire areas provide suitable foraging habitat for California Spotted Owls, (b) post-fire logging, shrub removal with herbicides, and tree plantation establishment likely harm spotted owls by removing perch sites, as well as habitat for the small mammal prey that the owls depend upon in high-severity fire areas, and (c) California Spotted Owls are declining in population, and are declining especially steeply in the area of the King fire, which is a spotted owl Area of Concern (which amplifies adverse impacts).

Response: a) The FEIS states that "owls may use high-severity fire as foraging habitat," but the extent to which owls use severely burned forests is unclear, and there is no indication of owl dependency on burned forest conditions (FEIS, pages 299 to 300). Post-fire habitat definitions used for the FEIS analysis may include more acreage than is actually suitable for foraging since they do not account for patch sizes, distance to nearest live trees, or precise canopy cover following fire (FEIS page 299). Broad definitions were used due to uncertainty over how owls

may use habitat in a large-scale burned landscape where low amounts of typical dense forest habitat is available for nesting, roosting, and foraging (FEIS page 299).

b) Post-fire logging, shrub removal with herbicides, and tree plantation establishment could affect owls through removal of perch sites or reduction of habitat suitability for small mammal prey (FEIS page 303). However, the alternative as modified by the Decision reduces this potential effect by not treating within 500 feet of low severity mortality (<50% basal area mortality) in post-fire owl territories. The FEIS (chapter 3, pages 302 to 304) acknowledges literature that suggests high-severity burned areas may be of more use to the owl where it occurs on the edges of low or moderate severity patches and less so in the interior of a large patch of high-severity. Trees in small high-severity patches adjacent to green forest patches are associated with the presence and abundance of small mammals and avian species (Fontaine 2009, Roberts et al. 2015, Campos and Burnett 2014), and such edges may provide important foraging opportunities for late-seral species such as the California spotted owl (Keane 2014, Roberts et al. 2011). Research suggests that within their habitat matrix, spotted owls depend on "green" stands with key habitat characteristics for nesting, repeated roosting, and for foraging. Territorial California spotted owl sites were well distributed within the buffer area outside of the fire perimeter; however, and detections of individual spotted owls just within the perimeter of the burned areas suggested that some spotted owls were exploiting the edge between the burned and unburned areas for foraging (Keane et al. 2012).

c) The Forest Service is attempting to achieve multiple objectives through implementation of this project. One purpose and need of the project is to balance active management with the retention of important attributes of post-fire habitat at the landscape scale and within treatment areas to support the diversity and abundance of species (FEIS page 5). The Forest Service is aware that the majority of the King Fire area occurs in a spotted owl area of concern (FEIS page 298) and persistence of spotted owls within and surrounding the fire area has been a serious consideration throughout project planning. Protection of spotted owls would be accomplished partly through no treatment areas which have been expanded to include areas within 500 feet of unburned or low severity burned forest, reducing the magnitude of hazard tree removal in PACs, snag/log retention, limited operating periods. It is true that implementation of the alternative as modified by the Decision may result in some habitat degradation, but the project focuses on large patches of high severity burn that don't currently meet spotted owl nesting or roosting requirements and the potential for effects to foraging habitat have been mitigated and disclosed. The Responsible Official is aware there may be impacts to California spotted owl as informed through the disclosure of potential effects in the FEIS that are updated in the BE and the ROD. The project has also been designed to allow the long-term spotted owl demographic study occurring in the King Fire area to provide important information about spotted owl response to high severity wildfire.

145. Comment (Commenter 11): The DEIS does not adequately analyze and disclose adverse impacts to the California spotted owl. First, the DEIS (p. 3-248) does not accurately represent the post-fire landscape in the course of citing and discussing Keane et al. (2012), by suggesting that the Moonlight-Antelope fire, which was similar to the King fire and Rim fire in intensity, created unsuitable conditions for Spotted Owls, leading to a loss of occupancy. In fact, all but one of the owl territories experienced massive post-fire clearcutting on private lands (and later on national forest lands) immediately adjacent to the PACs before the first breeding season after the fire, and all of those logged territories lost occupancy; the only territory that did not lose occupancy was the one that experienced no post-fire logging within 1.5 km of the nest/roost site (Bond and Hanson 2014 [California Spotted Owl ESA Listing Petition, Appendix D]).

Response: The FEIS (Chapter 3 page 300) states that "Unlike in the Rim Fire, the primarily high-severity Moonlight and Antelope Complex Fire areas [MACFA] did not support California spotted owls, other than a single pair that was using the landscape, based on two years of post-fire surveys (Keane et al. 2012). Territorial California spotted owl sites were well distributed within the buffer area outside of the fire perimeter; however, and detections of individual spotted owls just within the perimeter of the burned areas suggested that some spotted owls were exploiting the edge between the burned and unburned areas for foraging (Keane et al. 2012)." The researchers themselves concluded "results from our 2 years of work suggest that the primarily high-severity MACFA does not support CSOs other than a single pair that is using the landscape. Further, territorial CSO sites are well-distributed within the buffer area outside of the fire perimeter. Our 3 detections of individual CSOs just within the perimeter of the burned areas suggest that some CSOs are able to exploit the edge between the burned and unburned areas for foraging." (Keane, J., M. Conner, C.V. Gallagher, R.A. Gerrard, G. Jehle, and P.A. Shaklee. 2012. Plumas Lassen Administrative Study, 2011 Annual Report: Spotted Owl Module. U.S. Forest Service, Pacific Southwest Region, Vallejo, CA. pp. 85 – 86).

The California Spotted Owl ESA Listing Petition (page 98) states "All 9 sites lost occupancy by the pairs following extensive post-fire logging on adjacent private timberlands (and, later, on national forest lands), which began in the summer of 2007, just days and weeks after the fire occurred, indicating that post-fire logging, not fire, was the cause of lost occupancy (DellaSala et al. 2010)." DellaSala et al. (2010) is a reference to an editorial piece that was published in the Summer 2010 issuance of The Wildlife Professional (Vol. 4 No. 2); it does not provide additional peer-reviewed scientific literature. Keane et al. (2012) does not describe any correlation between logging on private lands and spotted owl occupancy within the Moonlight-Antelope fire area. However, given that logging occurred "just days and weeks after the fire occurred" it is possible that the effects of wildlife are confounded with the effects of logging. No evidence is presented to indicate that post-fire occupancy surveys were conducted prior to logging activities, and in the absence of this information it is unfounded to attribute loss of spotted owl occupancy within the Moonlight-Antelope fire area solely to logging activities.

The FEIS provides written analysis and disclosure of project-related effects to California spotted owl. Cumulative effects in FEIS account for private land salvage (FEIS Chapter 3 pages 52 to 53). Refer to the BE for additional information on determination of effects to CSO.

146. Comment (Commenter 11): The DEIS (p. 3-248) presents Lee et al. (2013), noting that territory extinction probability increased in the San Bernardino Mountains of southern California where there were higher levels of high-severity fire, but does not divulge that Lee et al. (2013) also found a relatively larger territory extinction effect from post-fire logging, and also concluded that the San Bernardinos are different from the Sierra Nevada forests in that there was far less pre-fire forest in the San Bernardinos, and thus far less room for owls to shift into new nest/roost habitat after fire (the DEIS also fails to note this finding regarding adverse effects of post-fire logging on p. 3-252, in the impacts analysis). Further, the personal communication reference to a Forest Service staff member (Marcie Baumbach) on p. 3-247 is inaccurate, given that Lee and Bond (2015) reported Spotted Owl occupancy in the Rim fire at one year post-fire even in territories with 100% high-severity fire, according to the same RAVG preliminary fire severity system used in the DEIS for the King fire (therefore, there were owls both nesting and roosting in territories mapped as 100% high-severity by RAVG).

Response: Lee et al. (2013) is the first study to examine the separate effects of fire severity and salvage logging on California spotted owls. They conducted the study in the mountains of southern California and compared owl occupancy at 97 unburned sites to 71 sites that were

burned/no salvage or burned/with salvage. Sites were 500 acres in size and contained an average of 263 acres (sd equals 60 acres) of suitable habitat. An average of 23% of suitable habitat burned at high severity within the 500 acre burned sites (FEIS Chapter 3 page 300). Lee et al. (2013) "found no statistically significant effects of fire or salvage logging on occupancy dynamics of spotted owls of southern California." Although not statistically significant, results suggested evidence of a potential threshold where extinction thresholds did not differ between unburned and burned sites when 0-124 acres of forested habitat burned, but that extinction probability increased as a function of the amount of habitat that burned at high severity above 124 acres. Of the 71 burned sites in the study, 75% had less than 124 acres of suitable habitat burn at high-severity. The FEIS (Chapter 3 page 300) states "Lee et al. (2013), found that in southern California extinction probability was significantly higher when >50 ha (123 acres) of suitable habitat burned at high severity compared to unburned sites, and that extinction probability increased in relation to the area burned". Both colonization and extinction parameters were correlated with the amount of habitat within the 500 acre core area. Taken together, results indicated that the relationships among amount of suitable habitat burned at high severity and extinction and colonization probabilities resulted in significant differences (standard errors did not overlap) in owl occupancy probabilities at sites where greater than 124 acres of suitable habitat burned at high severity. Salvage logging reduced owl occupancy an additional 0.054 at burned sites. Mean annual occupancy owl site occupancy was 0.346 at unburned sites, 0.239 at burned sites and 0.185 at burned/salvage logged sites between 2004-2010 (Lee et al. 2013).

Little information is available to disentangle the confounded effects of high severity fire and salvage logging on owl occupancy. This is a glaring information need, particularly at owl sites that experience 50-100 percent high severity wildfire as occurred in the King Fire. The commenter is correct that care should be used in drawing general conclusions from the Lee et al. (2013) study relevant to specific amounts of habitat, fire and salvage logging associated with owl occupancy dynamics to the King Fire. The Lee et al. (2013) study was conducted in southern California vegetation types that differ from the vegetation types occupied by owls within the King Fire and Sierra Nevada. Lee et al. (2013) states that "Because of the myriad differences between southern California and the rest of the species' range, our inferences are not directly applicable to spotted owls or their habitats outside of southern California." However, their results suggest important patterns that may be relevant to the King Fire. Their results indicate that owl occupancy dynamics were influenced by amounts of suitable habitat and amounts of high severity burn and document increasing negative effects of high severity fire as amounts increase beyond a threshold. Importantly, a threshold was identified whereby high severity fire effects were not observed at low amounts of high severity burn but increased as the proportion of high severity burn increased beyond a threshold. It is reasonable to hypothesize that similar thresholds may exist for owls that occupy forests in the Sierra Nevada. However, recent studies do not include many owl sites that burned at greater than 50 percent high-severity. Thus, it is unknown if thresholds exist above which high-severity fire may reduce post-fire occupancy in the Sierra Nevada. Research being conducted in the King Fire project area will further the available data helping to answer this question.

The personal communication reference to a Forest Service staff member (Marcie Baumbach) on FEIS Chapter 3 page 299 is accurate; post-Rim fire owls were not found nesting/roosting in the high-severity burned areas (Baumbach personal communication 31 July 2015). Lee and Bond (2015) do not present any information or discussion that supports the claim that birds are roosting or nesting in high-severity fire burn areas. Following the Rim fire, ten PACs were retired and six of them remapped into mostly green forested areas which is where the owls were found roosting (none of these birds nested the first year post-fire). Surveys found no birds roosting or nesting in high severity burn. There were nighttime detections in high-severity burn

areas, but never daytime detections in these areas anywhere within the fire area. Lee and Bond (2015) reported spotted owl occupancy associated with pre-fire PACs that maintained the same identification (name/code), but roost locations shifted post-fire and PACs were remapped to post-fire viable areas composed of almost entirely green forest. So, while the six territories were re-established (using the pre-fire PAC name and ID) and they are occupied, the birds are roosting and nesting in green forest that experienced low to moderate-severity burns; either in the green patches that survived the fire in the original PAC area or near the pre-fire PAC area.

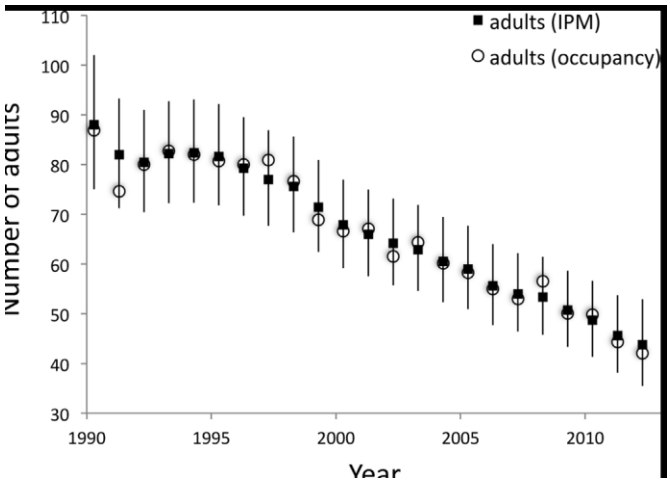
147. Comment (Commenter 11): The Action would cause severe effects to spotted owls for many reasons. First, it only protects a small amount of owl habitat in general (i.e., within 0.7 miles of a nest/roost), thus leaving potentially important parts of an owl's home range unprotected (see Bond et al. 2009, 2010, 2013). Second, even this 0.7 mile area is greatly violated due to the Action allowing substantial hazard tree logging and strategic zone logging within the 0.7 mile area. Third, there is also substantial private land logging occurring in owl home ranges that the Action will add to, and Table 3W-T.15 (p. 3-253) does not fully or adequately assess adverse cumulative impacts to owls from the combination of logging on public and private lands because only a 1.1 km radius is used, as opposed to the 1.5 km radius known to reflect the actual biological use of post-fire habitat by the owls (Bond et al. 2009).

Response: Studies on the Eldorado National Forest have documented that the average home range size of owls on the Eldorado National Forest exceeds the 0.7 mile radius. The area encompassed by a 0.7 mile (1,128-m) radius circle is not intended to represent the entire home range area that might be used by a spotted owl or spotted owl pair. Rather, the 0.7 mile radius circular area is a biologically meaningful approximation of non-overlapping spotted owl territories, since it is based on half the average nearest neighbor distance of territorial spotted owls in the Eldorado demographic study area. Studies published from research in the Eldorado demographic study area have used half the mean nearest neighbor distance as a basis for describing metrics associated with individual spotted owl territories (Seamans and Gutierrez 2007, Tempel et al 2014). This is an accepted approach for describing an owl territory, and the information is highly relevant to the King Fire project area since the demographic study occurs largely within the project area. A circular 0.7 mile radius area, centered on the nest or primary roost location contains approximately 1,000 acres the nest and roost locations used by an owl pair (Seamans and Gutierrez 2007). This area also includes the approximately 20 percent of a spotted owl home range that Bingham and Noon (1997) estimated to be the "overused" portion of a spotted owl's home range; in other words, the portion of the home range the supports the majority of foraging locations (USDA Forest Service 2001). This is a biologically meaningful area for both project design and for analyzing project effects. The 1.5-km radius circular area referenced in Bond et al. 2009 is a distance beyond which there were no discernable differences in owl foraging use patterns among burn severities (as determined from 7 individuals in 4 territories). It is based on few monitored owl sites and is not specific to the Central Sierra Nevada. The curve upon which it is based also shows that use declines precipitously beyond about 500-m. The King Fire Restoration project was designed and analyzed for effects to spotted owl habitat at three scales: 1) The 300-acre protected activity center (PAC) maintained to provide essential nesting, roosting and foraging habitat; 2) a 0.7 mile (1,128-m or 1.1-km) radius circle around the territory center; and 3) the landscape, which incorporates multiple overlapping spotted owl home ranges as well as unoccupied habitats (FEIS, Chapter 3 pg. 302). Roadside hazard tree removal and strategic fire management zone treatments are proposed for implementation across the project area, including within 0.7 miles of post-fire owl activity areas, because they are necessary to meet the imminent needs in the fire area such as hazard mitigations, restoration of severely burned areas, and establishment of future forests (FEIS

Chapter 1 pages 4 and 5). An alternative was developed that would protect a 1.5 kilometer area around every spotted owl activity center but was eliminated from detailed study because it did not meet the purpose and need (see response to Comment 104).

The FEIS recognizes that high-severity burn edges may be of use to the owl (FEIS Chapter 3 page 300). An alternative as modified by the Decision eliminates treatments within 500 feet of low severity burned habitat in post-fire owl territories. This change was made to maximize foraging opportunities in habitats along the edge of high-severity burned forest. The potential for impacts to California spotted owls in the area of the King fire from project implementation have been disclosed in the BE and further mitigated through LOPs, snag retention, and no treatment areas.

148. Comment (Commenter 11): Due to the severe impacts to California Spotted Owls, the Proposed Action would threaten the viability of owl populations and would further a trend towards listing under the ESA, and would do this unnecessarily, given that post-fire logging does not effectively reduce future fire severity and high-severity fire areas tend to burn at low/moderate-severity—not high-severity—when they reburn and given that the great majority of the roadside hazard tree logging is proposed along roads that are either already closed and have been for years, or are only suitable for high-clearance vehicles and are not maintained for general public use, and could simply be closed instead of clearcut within owl territories. The California Spotted Owl population is declining rangewide where pre- and post-fire logging is allowed, and is only stable on national park lands with active fire regimes and no logging (Bond and Hanson 2014 [CSO ESA Petition]), and the decline has been most severe in the area of the King fire in the approximately two decades prior to the fire (see figure below from Tempel et al. 2014):



Response: See response to Comment 117 and 118 regarding fire severity and severity of a subsequent reburn.

The FEIS identifies the purpose and need of removal of hazard trees that pose a significant safety concern not only to forest visitors but also to workers, private property, infrastructure, and cultural resources (FEIS pg. 4). The alternatives include the removal of hazard trees on National Forest System roads open to the public and roads needed for access to treatment areas, along private residential property, adjacent to structures and range improvements, and in specific cultural resource sties identified by the archaeologist (FEIS, pg. 12). Design criteria minimize the degree to which habitat in PACs would be affected by roadside hazard tree removal. Design Criteria TW-8 limits roadside hazard tree felling in PACs to imminent hazard trees (as opposed to those expected to fall in the next five years), and trees with

greater than 90 percent probability of mortality (as opposed to 70% probability of mortality used elsewhere) [FEIS, pg. 36]. The FEIS also specifies that a biologist would review hazard trees marked for removal in post-fire PACs.

An alternative was developed that would only cut and remove hazard trees on high-use roads maintained for public use (Level 3, 4, and 5 roads) or administrative facilities/infrastructure but was eliminated from detailed study because it did not meet the purpose and need (FEIS pgs. 38 to 39).

See response to Comment 150 for recent population status and trend information of California spotted owl. The BE and FEIS (Chapter 3, pgs. 298 to 311) disclose effects of project implementation to spotted owls. Treatments have been minimized/mitigated in the post-fire territories to a point where it has been determined that the alternative as modified by the Decision may affect individuals, but is not likely to result in a trend toward federal listing or loss of viability of California spotted owls in the planning area (BE).

149. Comment (Commenter 11): The 2004 Framework FEIS (p. 143-144) claimed that 4.5 California spotted owl Protected Activity Centers (PACs) were "lost" to higher-intensity fire since 1999 (providing a list of the 18 PACs), and claimed that an average of 4.5 PACs were being "lost" to fire each year. The 2004 Framework Record of Decision (ROD), on page 6, echoed this claim about losses of spotted owls to fire, and concluded that increased logging intensity was necessary in order to combat the threat of fire: "[G]iven that valuable [spotted owl] habitat is at high risk of being lost to wildfire, I cannot conclude that maintaining higher levels of canopy closure and stand density everywhere is the right thing to do."

New Scientific Information.
On August 1, 2004, the Associated Press published two investigative news stories on this claim of "lost" PACs, and found that: a) these PACs were generally still occupied by spotted owls; and b) the lead U.S. Forest Service wildlife biologist had been countermanded when he informed the Forest Service that the assertions about owl PACs being lost to fire were inaccurate (see attached news stories). Further, in 2009, scientists discovered, in a radiotelemetry study, that, while California spotted owls choose unburned or low/moderate-severity fire areas for nesting and roosting, the owls *preferentially select* high-severity fire areas (that have not been salvage logged) for foraging (Bond et al. 2009). Roberts (2008) found that spotted owl reproduction rates were 60% higher in mixed-severity fire areas (not salvage logged) than in unburned forest. Moreover, Lee et al. (2012) found that mixed-severity wildland fire (with an average of 32% high-severity fire effects) does not reduce California spotted owl occupancy in Sierra Nevada forests (indeed, a number of the PACs that the 2004 Framework FEIS claimed to be "lost" remain occupied), but post-fire logging appears to reduce spotted owl occupancy considerably. Moreover, new science concludes that logging within the home range of spotted owls reduces occupancy.

Bond, M. L., D. E. Lee, R. B. Siegel, & J. P. Ward, Jr. 2009a. Habitat use and selection by California Spotted Owls in a postfire landscape. Journal of Wildlife Management 73: 1116-1124. ***(In a radiotelemetry study, California spotted owls preferentially selected high-severity fire areas, which had not been salvage logged, for foraging.)***

Bond, M.L., D.E. Lee, R.B. Siegel, and M.W. Tingley. 2013. Diet and home-range size of California spotted owls in a burned forest. Western Birds 44: 114-126 ***(Home range size of spotted owls in the McNally fire was similar to, or smaller than, home ranges in unburned forests in the Sierra Nevada, indicating high territory fitness in post-fire habitat; owls in burned forest had a diet rich in small mammals, including pocket***

gophers.)

Ganey, J.L., S.C. Kyle, T.A. Rawlinson, D.L. Apprill, and J.P. Ward, Jr. 2014. Relative abundance of small mammals in nest core areas and burned wintering areas of Mexican spotted owls in the Sacramento Mountains, New Mexico. The Wilson Journal of Ornithology 126: 47-52. ***(Mexican spotted owls tended to leave unburned old forest nest cores, traveling up to 14 kilometers to spend the winter in mixed-intensity fire areas, where the small mammal prey base was 2 to 6 times greater than in the unburned old forest nest cores).***

Lee, D.E., and M.L. Bond. 2015. Occupancy of California spotted owl sites following a large fire in the Sierra Nevada, California. The Condor 117 (in press). ***(California spotted owl occupancy in the large (approximately 257,000 acres), intense Rim fire of 2013, at one year post-fire—before logging—was 92%, which is substantially higher than average annual occupancy in unburned mature/old forest, and pair occupancy was not reduced even when most of the territory experienced high-intensity fire).***

Lee, D.E., M.L. Bond, and R.B. Siegel. 2012. Dynamics of breeding-season site occupancy of the California spotted owl in burned forests. The Condor 114: 792-802. ***(Mixed-severity wildland fire, averaging 32% high-severity fire effects, did not decrease California spotted owl territory occupancy, and probability of territory extinction was lower in mixed-severity fire areas than in unburned mature/old forest. Post-fire salvage logging largely eliminated occupancy in areas that were occupied by owls after mixed-severity fire, but before salvage logging.)***

Moors, A. 2012&2013. Occupancy and reproductive success of Mexican spotted owls in the Chiricahua Mountains. Annual reports to the Coronado National Forest, Arizona for 2012 and 2013 field seasons. ***(After a 223,000-acre fire, Mexican spotted owl occupancy increased. Reproduction also increased, particularly in the territories that had the highest levels of high-intensity fire).***

Roberts, S.L. 2008. The effects of fire on California spotted owls and their mammalian prey in the central Sierra Nevada, California. Ph.D. Dissertation, University of California at Davis. ***(California spotted owl reproduction was 60% higher in a mixed-severity fire area [no salvage logging] than in unburned mature/old forest.)***

Seamans, M.E., and R.J. Gutiérrez. 2007. Habitat selection in a changing environment: the relationship between habitat alteration and spotted owl territory occupancy and breeding dispersal. The Condor 109: 566-576. ***(The authors found that commercial logging of as little as 20 hectares, or about 50 acres, in spotted owl home ranges significantly reduced occupancy.)***

Response: The 2004 Framework FEIS and ROD were written more than ten years ago. They were prepared with the best available science at the time. The evaluation of California Spotted Owl PACs in the King Fire is detailed in Appendix E of the DEIS and was guided by the designation standards set forth in the SNFPA ROD (page 37). The remapping effort was quite conservative given that the 10 spotted owl PACs that were removed from the system had less than 10 acres of suitable nesting/roosting post-fire habitat within 0.7 miles of the territory center. Additionally, PAC modifications have been updated for the FEIS as informed by (total coverage + 0.7 miles) post-fire surveys,

so there is little to no risk that PACs were mistakenly removed from that system or may still be occupied. Survey results and PAC changes resulting from surveys are described in the project BE. Given the large swaths of complete mortality resulting from the high severity fire it was evident where owls may or may not be able to return for breeding purposes. The remaining PACs concentrate on the fires edges and in the south portion of the fire where there are mixed severity conditions. Conclusions from existing scientific literature are debatable and the King Fire Project is informed by site specific post-fire survey and long-term demographic study information that is most relevant to the King Fire area and was incorporated into planning efforts. Treatments proposed within post-fire owl territories are limited to strategic fire management zones and hazard tree removal. Research by Roberts (2008) and Lee et al. (2012) focused on mixed-severity fire conditions and the FEIS does not debate the potential for owls to use those areas (FEIS page 300). Furthermore, the FEIS discloses that high-severity fire areas may be used for foraging spotted owls (pages 299 to 300; see response to Comment 144).

150. Comment (Commenter 11): The 2004 Framework FEIS (pp. 141-142) stated that, using the most current methods, at that time, of determining California spotted owl population trend, the data indicate "a stable population" for all of the Sierra Nevada spotted owl study areas. On December 23, 2014, ecologists Monica Bond and Chad Hanson submitted a Petition to U.S. Fish and Wildlife Service to list the California spotted owl under the Endangered Species Act due to threats from commercial thinning and post-fire logging on both private and National Forest lands (http://www.wildnatureinstitute.org/uploads/5/5/7/7/5577192/cso_fesa_petition_dec_22_2014.pdf).

Conner, M.M., J.J. Keane, C.V. Gallagher, G. Jehle, T.E. Munton, P.A. Shaklee, and R.A. Gerrard. 2013. Realized population change for long-term monitoring: California spotted owl case study. Journal of Wildlife Management 77: 1449-1458. ***(Using a more robust statistical analysis approach than the methods used previously, the authors found that California spotted owl populations are, and have been, declining in the Sierra Nevada, based upon results from the Lassen, Sierra, and Sequoia/Kings-Canyon study areas. The Sequoia/Kings-Canyon study area was the only one with an upward population trajectory, and is the only study area in protected forests, with an active mixed-intensity fire regime, and no mechanical thinning or post-fire salvage logging. The USFS study areas (Lassen and Sierra) have had extensive fire suppression, mechanical thinning, and post-firelogging.)***

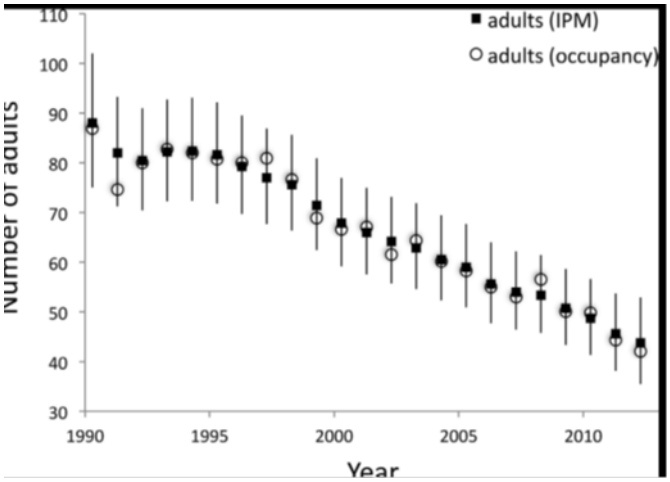
Stephens, S.L., S.W. Bigelow, R.D. Burnett, B.M. Collins, C.V. Gallagher, J. Keane, D.A. Kelt, M.P. North, L.J. Roberts, P.A. Stine, and D.H. Van Vuren. 2014. California Spotted Owl, songbird, and small mammal responses to landscape fuel treatments. BioScience (in press). ***Areas logged through mechanical thinning and group selection on national forest lands in the northern Sierra Nevada experienced an alarming 43% decline in California spotted owl populations within just a few years).***

Tempel, DJ. 2014. California spotted owl population dynamics in the central Sierra Nevada: an assessment using multiple types of data. PhD Dissertation, University of Minnesota, St. Paul, MN.

Tempel, D.J., and R.J. Gutiérrez. 2013. Relation between occupancy and abundance for a territorial species, the California spotted owl. Conservation Biology 27: 1087-1095. ***(In the remaining Sierra Nevada study area for the California spotted owl—the Eldorado study***

area—the authors found that spotted owl territories have been, and are, declining significantly. This study area is characterized by extensive fire suppression, mechanical thinning, and post-fire logging.)

Tempel, D.J., M.Z. Peery, and R.J. Gutiérrez. 2014a. Using integrated population models to improve conservation monitoring: California spotted owls as a case study. Ecological Modelling 289: 86-95.



Response: Regarding the 2014 Stephens et al study, the studies are referring to non-burned forest lands and not relevant to the management of burned areas. The Tempel et .al 2014 studies are a methodology for detections of the spotted owl and states, "we concluded that detection–nondetection data can provide reliable inferences on population trends, especially when funds preclude more intensive mark-recapture studies. The Conner et .al 2014 is also a methodology for determining population data. While the authors noted a population change, there was no claim in either paper that this was due to any particular management action.

The methodology used in the Conner paper (occupation rate at the beginning and end of a time period) to determine population change, was based on various monitoring within Northern California study areas. The metric used for the statistical analysis was based on the annual rate of population change in territorial owls from pre-existing data collected within areas with variable ownerships and differing management actions and concerns. It was not tied to internal physical variables within each of the study areas. As an example, the Eldorado Demography Study is 37 percent non-Forest Service lands; hence activities such as private resident development and private timber company harvest could have an impact on the occupancy of that study area.

There have been several statistical analyses of this sort performed on data for the California spotted owl with indications that the populations are declining despite SNFP mitigation measures for the species. Pre-and post-management monitoring actions that are analyzed, still continue to indicate that California spotted owl viability is tied to green forest canopy cover, density, and structural factors such as multistoried canopy cover, and large down wood and snags that are associated with decadence (SNAMP ; and lately with the incursion of barred owls.

In summary, the Forest acknowledges that there is a decline in spotted owls. However there is no statistical data from the above studies that tie burned forest management actions that have occurred, to the declines. Declines have been attributed to specific management actions, such as the removal of green forest nesting and roosting habitats (see above), barred owl activities and

climate change. Studies do not show that spotted owl declines are tied to the salvage of burned forest habitat, although it is clear that they forage within burned habitat. The following studies are regarding suitable habitat in burned forest:

Blakesley (2005) stated that "Site occupancy was positively associated with the amount of the nest area dominated by large trees with high canopy cover within the nest area. It was negatively associated with the amount of nonhabitat (nonforested areas and forest cover types not used for nesting or foraging) and with medium-sized trees with high canopy cover. Reproductive output was negatively related to elevation and nonhabitat within the nest area.". It was concluded that owls remain in burned territories that are no longer of high habitat quality because they had occupied the site in the previous year, but the study does not state that they are reproducing in burned habitat. Lee and Bond (2015) quoted from Blakesley (2005) that "Nest success was positively associated with the presence of large remnant trees within the nest stand. "..site occupancy, reproductive output, and apparent survival are all positively correlated with the amount of Spotted Owl habitat in a 200–800 ha area surrounding the nest"

Spotted owl occupancy and breeding after a fire appears to be associated with remaining high quality nesting and roosting habitat. Clark (2007) found that spotted owls would use low to moderate severity burned areas for roosting and foraging and high severity fires for foraging. Further in the paper he states that they were preferentially using unburned leave tree areas. Bond et .al (2009) data shows that owls preferentially selected no burn or low burn areas for nesting and roosting when they were available and that these areas retain their green forest nature and structural characteristics for these activities, It is further stated that they preferentially used unburned areas for roosting if they were available. They also found that occupancy probability by at least a single bird was negatively correlated with the amount of high severity fire in the PAC, although it still could be high.

The most recent population status and trend information can be found in Keane 2014, Conner et al. 2013, Tempel and Gutiérrez 2013, and Tempel et al. 2014." (DEIS 3-246), but "the factors driving these population trends are not known" (p. 441 Keane 2014). Tempel et al. 2014 suggest that reductions in the area of high-canopy forest resulting from either logging or high-severity wildfire could reduce the viability of California spotted owl populations and may be contributing to ongoing declines in abundance and territory occupancy. There are numerous speculations regarding this issue, but none presently show that proposed actions within burned forest habitat would affect the viability of the spotted owl.

Darren A. Clark. 2007. Demography and Habitat Selection of Northern Spotted Owls in Post-Fire Landscapes of Southwestern Oregon. Submitted for the degree of Master of Science in Wildlife Science at the Oregon State University.

Jennifer A, Blakesley David R. Anderson, Barry R. Noon. 2006. Breeding Dispersal In the California Spotted Owl. The Condor: February 2006, Vol. 108, No. 1, pp. 71-81.

Monica L. Bond, Derek E. Lee, Rodney B. Siegel and James P. Ward Jr. 2009. The Journal of Wildlife Management 73: 7, pp 1116–1124,

Tempel, D.J., R. J. Gutierrez, S.A. Whitmore, M.J. Reetz, R.E. Stoelting, W.J. Berigan, M.E. Seamans, M.Z Peery. 2014. Effects of forest management on California Spotted Owls: implications for reducing wildfire risk in fire-prone forests. Ecological Applications, 24(8), 2014, pp. 2089–2106.

Black Backed Woodpecker (BBW)

151. Comment (Commenter 11): Since the DEIS was released, significant new information has arisen that contradicts key conclusions in the DEIS regarding Black-backed Woodpecker

(BBWO) populations and trends in the Sierra Nevada. Appendix A of Roberts et al. (2015) (see attached), which was conducted for the Forest Service by Point Blue Conservation, found that a "sharp decrease" in BBWO populations is occurring in unburned forests throughout the Sierra Nevada in recent years (see Roberts et al. 2015, p. 39), and concluded that the data indicate a "strong change in green forest occupancy" appears to be occurring (Roberts et al. 2015, p. 40, and Figure A.1 on page 42). Roberts et al. (2015), Appendix A (pp. 39-42), hypothesized that BBWOs that previously occurred in unburned forest may have been increasingly moving into burned forest in recent years, as the last three years have had above-average fire amounts. Given this, for populations to be stable overall (in the face of declining populations in unburned forest), occupancy would have to increase substantially in burned forest recently. However, this is not the case; in a separate study conducted for the Forest Service by the Institute for Bird Populations specifically in burned forest, the authors found that occupancy in 2013 and 2014 were the lowest since the study began in 2009, and 2014 was the lowest year of all (page 2 of Siegel et al. 2015—see attached). Neither Roberts et al. (2015) nor Siegel et al. (2015) assessed their results in light of the other, so neither had the complete picture in terms of current BBWO population trends in the Sierra Nevada. The current declines are consistent with projections of Odion and Hanson (2013), given the amount of BBWO habitat that has been logged in recent fires (about 50%, or more, in the 2013 fires: Rim fire, American fire, and Aspen fire, e.g.—and similar or higher cumulative amounts are proposed for logging in the 2014 Bald and Eiler fires), and proposed in the King fire (similar loss of BBWO pairs projected, in terms of cumulative total—see p. 3-276). In light of this significant new information, a Supplemental DEIS must be prepared (with additional public comments allowed).

Response: This article was published between the draft and final EIS and was reviewed, but did not result in a substantial change in analyzed project impacts. The commenter's conclusions about the new information are speculative, and as stated above, is presented as a hypothesis by the author. As the commenter pointed out, "Neither Roberts et al. (2015) nor Siegel et al. (2015) assessed their results in light of the other." The findings and, more importantly, the discussions related to those findings are consistent in indicating that reduced occupancy within green forests or burned forests may be the result of individual Black-backed woodpeckers vacating previously occupied home ranges to take advantage of recently burned areas. The authors of the Robert's study did not imply that the observed declines in occupancy were anything more than as stated, that individual woodpeckers vacated previously held home ranges to take advantage of recently burned areas, and did not imply that the species was in jeopardy. The commenter's suggestion that this study indicates a heightened concern regarding the status of the species' population is not supported.

It cannot be concluded that proposed project actions would adversely affect BBWO populations that may inhabit unburned forests. There remains over 70 percent of the King fire that is suitable for the woodpecker (FEIS pg. 328) that is not being treated. There is no evidence that available habitat is currently saturated, and BBWOs are likely able to move to adjacent untreated areas. This species has the ability to disperse from occupied home ranges within green or burned forest habitat in order to take advantage of and colonize newly burned areas. Given this recognized ability to colonize new areas, individual woodpeckers that may be displaced by salvage harvest should be able to find suitable habitat within unsalvaged portions of the same fire or within other fires or nearby green forest. There is no evidence to suggest that woodpeckers displaced by salvage harvest would simply die.

Presently, there is only one-year of occupancy numbers, which is not adequate data for a determination for a population-level decline. Several years of data are required to see if a population pattern is experiencing variability or if it is undergoing a true decline. Siegel et al (2015) stated, "… the proportion of occupied fires has remained constant. While the

significantly lower point-level occupancy in 2014 indicates that overall abundance of black-backed woodpeckers was lower in the past year, this does not yet indicate a declining population trend." Given the confidence index in these model estimates it is not enough to conclude that the population is going through a real decline. There are other factors associated with green forests that researchers need to incorporate before making any inference about the stability of the BBWO population within them or within burned forest habitats. (adapted from Jay Roberts email (6/16/2015) to French Fire biologist forwarded from Alissa Fogg)

152. Comment (Commenter 11): The DEIS does not adequately analyze or disclose highly uncertain and unknown effects, and cumulative effects, that will result from plans to conduct post-fire logging in Black-backed Woodpecker nesting season—potentially directly killing chicks in the nest before they can fledge (in both 2015 and 2016 nesting seasons), contrary to the explicit recommendations of the Forest Service's own scientists in the Forest Service's Black-backed Woodpecker Conservation Strategy (Bond et al. 2012; see also attached comments from Monica Bond). The Forest Service's refusal to include this very reasonable mitigation recommended by the Conservation Strategy will result in compounded, multiplied adverse impacts to Black-backeds by creating an ecological trap (i.e., the fire draws in Black-backeds, which then nest and attempt to reproduce in the fire, only to be directly killed by felling of nest trees, or logging of all snags around nest trees). The DEIS does not meaningfully or adequately address this issue. The Forest Service does not plan to use surveys for Black-backed nests prior to logging in a given nesting season, and no such surveys are proposed in the action alternatives. Moreover, even if a Black-backed nest is not cut down, the removal of all or nearly all snags in their home range surrounding the nest tree would leave the birds with insufficient food (wood-boring beetle larvae in fire-killed trees) to survive, resulting in likely starvation. This is a NEPA issue pertaining to disclosure of potentially significant impacts, not a forest plan management direction issue under NFMA.

Response: See response to Comment 106 regarding LOPs. In addition, the 2015 breeding season for the BBWO is past.

The potential effects of the project to black-backed woodpeckers were analyzed in the wildlife species section of the FEIS (pgs. 324 to 329) and are further assessed in the BBWO Report in the project record. The BBWO Report and the Migratory Landbird Conservation Report (2015) update the project proposal and its specific effects, including potentially killing or disturbing BBWOs.

The analysis used the Tingley model to help quantify the potential effects of the proposed action on the predicted number of woodpecker pairs the fire area could support. The model predicts generic occupancy, but does not predict the specific occurrence of actual birds, so the potential effects to habitat were also quantified. This information is further expanded in the BBWO Report. This analysis was informed by the latest research on the species. The levels of effects of the proposed project to this species or its habitat are well defined in recent literature and the Conservation Strategy and can be analyzed and determined within the NEPA process.

Black-backed woodpeckers have no federal conservation status, but are an MIS for burned forest habitat. Analysis within the FEIS and other wildlife reports indicate that impacts to the species are minor, and that most territorial habitat (64 percent of potential pair territories) remains as habitat for the species, and would not be impacted by project activities, providing both foraging and nesting habitat (FEIS, pg. 328).

153. Comment (Commenter 11): The DEIS does not adequately analyze cumulative effects from fuelwood tree cutting, which would result in *additional* loss of Black-backed pairs over and above the cumulative loss of pairs from ongoing logging on private lands and planned logging on USFS lands. The DEIS does not estimate or disclose the likely extent of additional pairs that would/could be lost from fuelwood cutting, nor does the DEIS propose any restrictions on fuelwood cutting in the action alternatives. Moreover, the DEIS again ignores the recommendations of the Black-backed Woodpecker Conservation Strategy on this issue—i.e., the recommendation that fuelwood cutting be prevented after fires in order to protect nesting Black-backeds from compounded and cumulative adverse impacts. Nowhere does the DEIS identify a single restriction on the location of fuelwood cutting in the DEIS's action alternatives, nor do the DEIS or specialist reports identify any such restriction in the forest plan.

Response: Removal of dead trees for firewood is not expected to represent a substantive cumulative effect in terms of snag reduction as firewood removal is only allowed for dead trees smaller than 10 inches diameter at eye level. Additionally, firewood harvest would primarily occur immediately along roads, and effects associated with roadside hazard tree removal have accounted for this loss of habitat in the FEIS and Black-backed Woodpecker Final Assessment.

Observations of Siegel et al. (2013) indicate that firewood harvest does not constitute a loss of habitat for black-backed woodpecker alongside roads because areas where cutting would take place would be those that would already have been harvested for roadside hazard tree removal, and the analysis of direct and indirect effects already takes into account the adverse impacts in the EIS regarding effects to the black-backed woodpeckers and their habitat. The potential effects of firewood harvest do not represent a significant cumulative effects issue.

154. Comment (Commenter 11): The DEIS does not adequately analyze cumulative effects from "flushing" of pines (production of new green foliage one year post-fire in pines that appear to be dead initially, but are not), and the extent to which this will lead to less overall Black-backed Woodpecker habitat being available in the fire, and even fewer pairs remaining after logging than the DEIS currently reports. On our site visits to the fire over the spring of 2015, we have seen extensive flushing already beginning pervasively in the fire area in trees with 100% crown scorch (0% green needles) among trees with brown (not black) needles on the upper crown (see attached photos).

Response: The FEIS acknowledges the potential for flushing (FEIS, pg. 200). "Review of the treatment area with Forest Health Protection staff has identified a high probability for continued mortality of residual trees in the low and moderate severity portions of the fire. In pine plantations that burned at 50 percent mortality and higher, it is likely that some trees will flush with new growth in the spring following the fire (2015), but will experience high levels of mortality from boring beetles throughout the summer (FHP Report SS15-002, 2015)." Hazard tree marking guidelines based on mortality are described on page 2-5. The fire-injured tree marking guidelines are based on the publications: Marking Guidelines for Fire-Injured Trees in California (Smith and Cluck 2011) and Hazard Tree Guidelines for Forest Service Facilities and Roads in the Pacific Southwest Region (Angwin et al. 2012). A 90 percent probability of mortality would be used in Riparian Conservation Areas and Protected Activity Centers. A 70 percent probability of mortality would be used for hazard tree removal outside of PACs and RCAs. As stated in the FEIS: "salvage harvest is limited to dead trees which have been defined for this project as trees with no visible green needles; trees with some green needles may occasionally meet the definition of a hazard tree and be removed during roadside hazard treatments" (FEIS Wildlife-Terrestrial, Effects Analysis Methodology, Assumptions of the Analysis, page 280). "The retention of trees with green needles and with trees with a moderate

to high probability of mortality will further increase the number of snags per acre in the short term" (FEIS, pg. 207-208).

155. Comment (Commenter 11): The DEIS (p. 3-273) does not adequately analyze impacts and cumulative effects from the substantial increase in intensity/degree of removal of Black-backed Woodpecker suitable habitat relative to levels in recent years, i.e., a much higher proportion of Black-backed habitat/pairs is planned to be removed in the King fire (about half, cumulatively—see p. 3-276) than the average of 31% on all lands, according to the regional analysis in the DEIS and specialist reports. This is especially true given that Odion and Hanson (2013) found that, over the next three decades, logging even one-third of Black-backed habitat, in combination with ongoing fire suppression and thinning, would lead to a loss of most of the existing Black-backed population in the California/Oregon subspecies within that timeframe, and would create a substantial risk of extinction. The Forest Service's plan to conduct logging that would result in the overall cumulative loss of about half of Black-backed pairs (likely even more, given unrestricted fuelwood cutting that would follow post-fire logging), is vastly in excess of the level that Odion and Hanson (2013) found represents a major threat of extinction for this species.

Response: The Forest Plan identifies the black-backed woodpecker as the management indicator species (MIS) for the snags in burned forest ecosystem component (Sierra Nevada Forests Management Indicator Species Amendment Record of Decision (SNF MIS Amendment ROD, December 2007). Distribution population monitoring and habitat monitoring for the black-backed woodpecker is conducted at the Sierra Nevada scale (SNF MIS Amendment ROD, pp. 2-3). Project-level effects on MIS habitats are analyzed and disclosed as part of environmental analysis under the National Environmental Policy Act. Project-level impacts to habitat are then related to bioregional-scale (Sierra Nevada-wide) population and/or habitat trends. Population monitoring data indicate a stable population distribution in the Sierra Nevada in which black-backed woodpeckers continue to be distributed across the 10 National Forests in the study area (ranging from the Modoc National Forest in the north to the Sequoia National Forest to the south). As defined for MIS, a stable population trend means that the distribution population monitoring data for the black-backed woodpecker indicate that the direction of change is neither increasing nor decreasing.

Odion and Hanson (2013) findings were based on modeling projections, not empirical findings, as stated in that paper. As the authors state, "…it is important to recognize uncertainty in the projected effect of strategically treating 20% of the mature forested landscape [a level used in their modeling]. This is based on modeling projections, not empirical findings. Future fire is also uncertain due to climate change." Modeling may be used to indicate any level of desired concern based upon the parameters fed into the model. One of the primary parameters was that 20%of mature forested landscapes would be thinned in a 27-year period, and this in turn would reduce wildfire by 50%. There are no plans, and no policy, to thin 20%of mature forested landscape on USFS lands within California, especially not in the 27-year period in which these treatments were assumed to take place. Also, the authors do not state the assumptions they made about post-thinning stand attributes, but apparently assumed that any "thinned" stand would represent non-habitat. Due to constraints on timber harvest as a result of the 2004 SNFPA ROD, thinning within mixed-conifer or true fir forests generally retains 40% or greater canopy cover within the thinned stands. This is within the level (albeit at the lower level) of canopy closure that is used to define forested stands that, when burned, provide suitable black-backed woodpecker habitat. In addition, the parameter of a 50% reduction in wildfire, assumed to result from this thinning effort, is also not reflective of a policy goal or reality.

The FEIS (pg. 325) adequately analyzed impacts and cumulative effects from removal of BBWO suitable habitat at the Project and regional scale through the Tingley model (Tingley et al, 2014) and regional analysis, and the final BBWO report more closely analyzes these effects. The cumulative effects analysis in the King Fire Restoration Project is conservative in the assumption of the proportion of BBWO pairs predicted to be potentially affected by treatment in that 100% treatment of private land and 100% implementation of planned FS treatments (FEIS pg. 328). These figures are modified in the final Black-backed woodpecker assessment report, which describes that habitat would be retained for about 64 percent of the potential BBWO population on NFS lands, under the alternative as modified by the Decision. Removal of dead trees for firewood is not expected to represent a substantive cumulative effect in terms of snag reduction as firewood removal is permitted only for dead trees smaller than 10 inches diameter at eye level and would primarily occur immediately along roads, in relatively flat areas that allow off-road travel and are closer to community areas.

Region 5 analyses (2015) show that 20% of the FS acres that burned from 2007-2014 and are suitable for black-backed woodpeckers have been, or are proposed to be treated with post-fire tree removal including the proposed King Fire Restoration Project. Estimates for all lands (regardless of landowner) show that a maximum of 35% of the acres that burned in the range of the Black-backed Woodpecker in California from 2007-2014 have been, or are proposed to be treated with post-fire timber removal (of which 20% occur on FS lands). This value for treated acres on all lands is likely an overestimate because it includes the assumption that all "other lands" (non-FS and non-NPS) are harvested following a fire. The King Fire Restoration project affects proportionally more habitat at the project scale (30% FS, 50% cumulative) than the 8-year average (20% FS, 35% cumulative) at the state scale, however the King Fire proposal is included in the average.

Amount of burned suitable black-backed woodpecker habitat that has been subsequently treated (tree removal) or untreated (no tree removal) within the range of the black-backed woodpecker in California from fires occurring in 2007-2014 where the fire severity resulted in 50% or greater basal area loss. Treated acres includes proposed tree removal for 2015. Data are broken down by landowner (Forest Service, National Park Service, and Other) or summed for "all" lands. See text for methods and assumptions.

	Treated[a]	Untreated	Total	% Treated
FS lands	49,642	197,289	246,931	20%
NPS[b]	0	25,729	25,729	0%
Other[c]	69,299	0	69,299	100%
All lands[d]	118,941	223,017	341,958	35%

[a] Treated values include acres that are proposed for treatment in 2015.

[b] For NPS lands we assumed no burned acres were treated. Only fires that burned on both Forest Service and NPS lands are included (see text) so we likely underestimate untreated acres.

[c] For Other lands we assumed that all of the burned acres were treated.

[d] For All lands we summed values for FS, NPS, and Other lands.

156. Comment (Commenter 11): The DEIS's claims (p. 3-273) that there will be an increase in high-severity fire, and therefore Black-backed habitat, in the future is misleading because more recent research concludes that high-severity fire has not increased in the Sierra Nevada since

1984 (Hanson and Odion 2015), and because, even if an increase does occur in the future—which is highly speculative—we have seen in the King fire project and other recent projects that any such increase would be met with an even larger increase in post-fire logging.

Response: The Hanson and Odion data (2014) is contrary to three other studies (Miller et al. 2009, Miller and Safford 2012, Mallek et al. 2013) that indicate fire severity is on the rise. Hanson and Odion (2014) is the only study that has found that the proportion and amount of high severity is not increasing in the Sierra Nevada. Hanson and Odion make this assertion based upon differing fire scenarios, from all jurisdictions, including state, private, USFS and NPS.

Differing management objectives across jurisdictions result in different severity responses. For example, salvage logging practices on commercial and private timber lands often entail removing scorched, but still live trees, within the first couple months after fire containment (Zhang et al. 2008). Hanson and Odion's data are based upon satellite images the year after fire containment (Eidenshink et al. 2007). Because of this, the amount of high severity on private lands is over estimated in their dataset. By including prescribed fires, Hanson and Odion also underestimate the amount of high severity due to wildfires on National Park Service lands. because these lands are managed under a policy of wildland fire use while USFS lands are almost entirely managed under a policy of strict fire suppression.

Currently scientific disagreement exists in whether or not there is an increase in fire severity in the Region. Miller et al. (2009) and Miller and Safford (2012) found "broad-scale, quantitative demonstration that the extent of forest stand replacing fire is increasing across a significant part of the western US." Miller et al. (2009) conducted an assessment of the trend in fire size and annual area burned between 1908 and 2006, as well as the trend in high-severity (stand-replacing) fire between 1984 and 2006, in the Sierra Nevada and southern Cascade Mountains and found that the extent of forest stand-replacing fire is increasing, with increases in fire number, fire size, annual burned area, and, at least since 1984, fire severity.

The Commenter's assertion that the analysis of black-backed woodpecker habitat is misleading because even if fire severity does increase in the future that it would be met with even larger projects is speculative and not based on existing data. Region 5 analyses (2015) show that 20% of the FS acres that burned from 2007-2014 and are suitable for black-backed woodpeckers have been, or are proposed to be treated with post-fire tree removal including the proposed King Fire Restoration Project and the amount harvested per project has been consistent (see Comment 155). The value for treated acres on all lands is an overestimate because it includes the assumption that all "other lands" (non-FS and non-NPS) are harvested in a similar fashion over a similar time frame following a fire.

157. Comment (Commenter 11): The 2004 Framework FEIS did not recognize any significant conservation threats to the Black-backed Woodpecker, and the 2004 Framework ROD (p. 52) allowed post-fire clearcutting in 90% of any given fire area, and allowed up to 100% of high-severity fire areas to be subjected to post-fire clearcutting by requiring retention of only 10% of the total fire area unlogged (i.e., the 10% retention can be in low-severity fire areas). Black-backed Woodpeckers rely upon large patches (generally at least 200 acres per pair) of recently killed trees (typically less than 8 years post-mortality) with very high densities of medium and large snags (usually at least 80-100 per acre), and any significant level of post-fire salvage logging largely eliminates nesting and foraging potential. Moreover, Hanson et al. (2012) (the Black-backed Woodpecker federal Endangered Species Act listing petition) found that there

are likely less than 700 pairs of Black-backed Woodpeckers in the Sierra Nevada, and they are substantially threatened by ongoing fire suppression, post-fire salvage logging, mechanical thinning "fuel reduction" logging projects, and possibly climate change. On April 8, 2013, the U.S. Fish and Wildlife Service determined that the Sierra Nevada and eastern Oregon Cascades population of this species may be warranted for listing under the ESA. In addition, in the fall of 2012, the Forest Service determined that there is a significant concern about the conservation of Black-backed Woodpecker populations, in light of new scientific information indicating that current populations may be dangerously low and that populations are at risk from continued habitat loss due to fire suppression, post-fire logging, and mechanical thinning, recommending some key conservation measures to mitigate impacts to the population (Bond et al. 2012).

Bond, M.L., R.B. Siegel, and D.L. Craig. 2012. A Conservation Strategy for the Black-backed Woodpecker (*Picoides arcticus*) in California—Version 1.0. The Institute for Bird Populations, Point Reyes Station, California, For: U.S. Forest Service, Pacific Southwest Region, Vallejo, CA. ***(Conservation recommendations include: a) identify the areas of the highest densities of larger snags after fire, and do not salvage log such areas (Recommendation 1.1); b) in areas where post-fire salvage logging does occur, do not create salvage logging patches larger than 2.5 hectares in order to maintain some habitat connectivity and reduce adverse impacts on occupancy (Recommendation 1.3); c) maintain dense, mature forest conditions in unburned forests adjacent to recent fire areas in order to facilitate additional snag recruitment (from beetles radiating outward from the fire) several years post-fire, which can increase the longevity of Black-backed Woodpecker occupancy in fire areas (Recommendation 1.4); d) do not conduct post-fire salvage logging during nesting season, May 1 through July 31 (Recommendation 1.5)); and e) maintain dense, mature/old unburned forests in order to facilitate high quality Black-backed Woodpecker habitat when such areas experience wildland fire (Recommendation 3.1).***

Burnett, R.D., P. Taillie, and N. Seavy. 2011. Plumas Lassen Study 2010 Annual Report. U.S. Forest Service, Pacific Southwest Region, Vallejo, CA. ***(Black-backed Woodpecker nesting was eliminated by post-fire salvage. See Figure 11 [showing nest density on national forest lands not yet subjected to salvage logging versus private lands that had been salvage logged.)***

Burnett, R.D., M. Preston, and N. Seavy. 2012. Plumas Lassen Study 2011 Annual Report. U.S. Forest Service, Pacific Southwest Region, Vallejo, CA. ***(Black-backed Woodpecker potential occupancy rapidly approaches zero when less than 40-80 snags per acre occur, or are retained (Burnett et al. 2012, Fig. 8 [occupancy dropping towards zero when there are fewer than 4-8 snags per 11.3-meter radius plot—i.e., less than 4-8 snags per 1/10th-acre, or less than 40-80 snags per acre.)***

Hanson, C. T. and M. P. North. 2008. Postfire woodpecker foraging in salvage-logged and unlogged forests of the Sierra Nevada. Condor 110: 777–782. ***(Black-backed Woodpeckers selected dense, old forests that experienced high-severity fire, and avoided salvage logged areas [see Tables 1 and 2].)***

Hutto, R. L. 2008. The ecological importance of severe wildfires: Some like it hot. Ecological Applications 18:1827–1834. ***(Figure 4a, showing about 50% loss of Black-backed Woodpecker post-fire occupancy due to moderate <u>pre</u>-fire logging [consistent with mechanical thinning] in areas that later experienced wildland fire.)***

Odion, D.C., and Hanson, C.T. 2013. Projecting impacts of fire management on a biodiversity indicator in the Sierra Nevada and Cascades, USA: the Black-backed Woodpecker. The Open Forest Science Journal 6: 14-23. ***(High-severity fire, which creates primary habitat for Black-backed Woodpeckers, has declined >fourfold since the early 20th century in the Sierra Nevada and eastern Oregon Cascades due to fire suppression. Further, the current rate of high-severity fire in mature/old forest (which creates primary, or high suitability, habitat for this species) in the Sierra Nevada and eastern Oregon Cascades is so low, and recent high-severity fire in mature/old forest comprises such a tiny percentage of the overall forested landscape currently (0.66%, or about 1/150th of the landscape), that even if high-severity fire in mature/old forest was increased by several times, it would only amount to a very small proportional reduction in mature/old forest, while getting Black-backed Woodpecker habitat closer to its historical, natural levels. Conversely, the combined effect of a moderate version of current forest management—prefire thinning of 20% of the mature/old forest (in order to enhance fire suppression) over the next 27 years, combined with post-fire logging of one-third of the primary Black-backed Woodpecker habitat, would reduce primary Black-backed Woodpecker habitat to an alarmingly low 0.20% (1/500th) of the forested landscape, seriously threatening the viabilityof Black-backed Woodpecker populations.)***

Odion D.C., Hanson C.T., Arsenault A., Baker W.L., DellaSala D.A., Hutto R.L., Klenner W., Moritz M.A., Sherriff R.L., Veblen T.T., Williams M.A. 2014. Examining historical and current mixed-severity fire regimes in ponderosa pine and mixed-conifer forests of western North America. PLoS ONE 9: e87852. ***(High-severity fire has declined fourfold in the Sierra Nevada since the early 20th century, due to fire suppression.)***

Rota, C.T. 2013. Not all forests are disturbed equally: population dynamics and resource selection of Black-backed Woodpeckers in the Black Hills, South Dakota. Ph.D. Dissertation, University of Missouri-Columbia, MO. (***Rota (2013) finds that Black-backed Woodpeckers only maintain stable or increasing populations (i.e., viable populations) in recent wildland fire areas occurring within dense mature/older forest (which have very high densities of large wood-boring beetle larvae due to the very high densities of medium/large fire-killed trees). And, while Black-backeds are occasionally found in unburned forest or prescribed burn areas, unburned "beetle-kill" forests (unburned forest areas with high levels of tree mortality from small pine beetles) and lower-intensity prescribed burns have declining populations of Black-backed Woodpeckers (with the exception of a tiny percentage of beetle-kill areas). The study shows that unburned beetle-kill forests do not support viable populations, but very high snag-density beetle-kill areas tend to slow the population decline of Black-backed Woodpeckers in between occurrences of wildland fire. Population decline rates are alarmingly fast in low-intensity prescribed burn areas, indicating that such areas do not provide suitable habitat. Black-backed Woodpeckers are highly specialized and adapted to prey upon wood-boring beetle larvae found predominantly in recent higher-severity wildland fire areas. Moreover, while Black-backed Woodpeckers are naturally camouflaged against the charred bark of fire-killed trees, they are more conspicuous in unburned forests, or low-severity burned forests, and are much more vulnerable to predation by raptors in such areas. For this reason, even when a Black-backed Woodpecker pair does successfully reproduce in unburned forest or low-severity fire areas, both juveniles and adults have much lower survival rates than in higher-severity wildland fire areas.)***

Saab, V.A., R.E. Russell, and J.G. Dudley. 2009. Nest-site selection by cavity-nesting birds in relation to postfire salvage logging. Forest Ecology and Management 257: 151–159. ***(Black-backed Woodpeckers select areas with about 325 medium and large snags per hectare [about***

132 per acre], and nest-site occupancy potential dropped to near zero when snag density was below about 270 per hectare, or about 109 per acre [see Fig. 2A, showing 270 snags per hectare as the lower boundary of the 95% confidence interval].)

Seavy, N.E., R.D. Burnett, and P.J. Taille. 2012. Black-backed woodpecker nest-tree preference in burned forests of the Sierra Nevada, California. Wildlife Society Bulletin 36: 722-728. ***(Black-backed Woodpeckers selected sites with an average of 13.3 snags per 11.3-meter radius plot [i.e., 0.1-acre plot], or about 133 snags per acre.)***

Siegel, R.B., M.W. Tingley, and R.L. Wilkerson. 2011. Black-backed Woodpecker MIS surveys on Sierra Nevada national forests: 2010 Annual Report. A report in fulfillment of U.S. Forest Service Agreement No. 08-CS-11052005-201, Modification #2; U.S. Forest Service Pacific Southwest Region, Vallejo, CA. ***(Black-backed woodpecker occupancy declines dramatically by 5-7 years post-fire relative to 1-2 years post-fire, and approaches zero by 10 years post-fire [Fig. 15a].)***

Siegel, R.B., M.W. Tingley, R.L. Wilkerson, M.L. Bond, and C.A. Howell. 2013. Assessing home range size and habitat needs of Black-backed Woodpeckers in California: Report for the 2011 and 2012 field seasons. Institute for Bird Populations. ***(Black-backed woodpeckers strongly select large patches of higher-severity fire with high densities of medium and large snags, generally at least 100 to 200 hectares (roughly 250 to 500 acres) per pair, and post-fire salvage logging eliminates Black-backed woodpecker foraging habitat [see Fig. 13, showing almost complete avoidance of salvage logged areas]. Suitable foraging habitat was found to have more than 17-20 square meters per hectare of recent snag basal area [pp. 45, 68-70], and suitable nesting habitat was found to average 43 square meters per hectare of recent snag basal area and range from 18 to 85 square meters to hectare [p. 59, Table 13]. Moreover, Appendix 2, Fig. 2 indicates that the Sierra Nevada population of Black-backed Woodpeckers is genetically distinct from the Oregon Cascades population, though additional work needs to be conducted to determine just how distinct the two populations are. Siegel et al. 2013 also found that the small number of Black-backed Woodpeckers with mostly unburned forest home ranges had home ranges far larger than those in burned forest, and that the birds in unburned forest were traveling more than twice as far as those in burned forest in order to obtain lesser food than those in burned forests, indicating that such areas do not represent suitable, viable habitat for this species.)***

Tarbill, G.L. 2010. Nest site selection and influence of woodpeckers on recovery in a burned forest of the Sierra Nevada. Master's Thesis, California State University, Sacramento. ***(In post-fire eastside pine and mixed-conifer forests of the northern Sierra Nevada, Black-backed woodpeckers strongly selected stands with very high densities of medium and large snags, with well over 200 such snags per hectare on average at nest sites [Table 2], and nesting potential was optimized at 250 or more per hectare, dropping to very low levels below 100 to 200 per hectare [Fig. 5b].)***

USFWS. 2013. 90-day Finding on a Petition to List Two Populations of Black-backed Woodpecker as Threatened or Endangered. U.S. Fish and Wildlife Service, Washington, D.C., April 9, 2013. ***(USFWS (2013), on page 14, "conclude[d] that the information provided in the petition or in our files present substantial scientific or commercial information indicating that the petitioned action may be warranted for the Oregon Cascades-California and Black Hills populations of the black-backed woodpecker due to the present or threatened destruction, modification, or curtailment of the populations' habitat or range as a result of salvage logging, tree thinning, and fire suppression activities throughout***

their respective ranges." USFWS (2013), on page 19, also "conclude[d] that the information provided in the petition and available in our files provides substantial scientific or commercial information indicating that the petitioned action may be warranted due to small population sizes for the Oregon Cascades-California and Black Hills populations, and due to climate change for the Oregon Cascades-California population." USFWS (2013), at pages 18-19, concluded that substantial scientific evidence indicates that current populations may be well below the level at which a significant risk of extinction is created based upon Traill et al. (2010), and concluded that, while some climate models predict increasing future fire, others predict decreasing future fire (due to increasing summer precipitation), and, in any event, models predict a shrinking acreage of the middle/upper-elevation conifer forest types upon which Black-backed Woodpecker depend most (range contraction).)

Response: Regarding new articles published about the black-backed woodpecker, the agency is responsible for considering new information at the project level, when such information is relevant to the project being considered. Literature being provided by the commenters is being reviewed and addressed as it pertains to the design and effects of the project on the black-backed woodpecker. Until the LRMP revisions are completed for the Sierra Nevada National Forests, this information and changed circumstances were addressed in the site-specific King Fire project context. The above studies and Conservation Strategy were considered in the development of the project.

Regarding the Conservation Strategy, it's purpose "..is to provide a roadmap for conserving black-backed woodpeckers in California through informed management." (Bond et al. 2012, p. 1). It seeks to summarize known information about the species, recommends management approaches for conservation, and suggests future research priorities (pp. 1-2). It is not Forest Service guidance or direction, and it is not a regulatory document. Thus the Forest Service is not legally bound to follow the recommendations in the strategy.

Regarding home range size, The Tingley Model (2014 was used to determine the potential pair territories within the fire perimeter that would be impacted project activitities. The FEIS recognizes that BBWOs home ranges vary starting from ~60 acres per pair (Siegel et al. 2013 and Tingley et al. 2014, FEIS pg. 324) of suitable habitat as defined by CWHR types: size 3-6, pre-fire density M-D, in conifer types, where post-fire basal area mortality is greater than or equal to 50 percent. The effects of post-fire salvage logging on nesting and foraging habitat potential are also disclosed in the DEIS (Table 3W-T.29, Summary of Comparison of Effects for Each Alternative on BBWO Habitat and Pairs, pg. 328). Hanson et al. 2012, USFWS 2013, and Bond et al. 2012 were reviewed for the analysis of impacts to BBWO.

Regarding the April 9, 2013 review of the Oregon Cascades-California and Black Hills populations of the black-backed woodpecker as distinct population segments or subspecies, the USFWS concluded that listing may be warranted (USFWS 2013; 78 FR 21086) following further review. This finding does not mean USFWS has decided to give the black-backed woodpecker Federal protection under the Endangered Species Act. Rather, the Agency is embarking on the first step in a longer process that triggers a more thorough review of the species. In this review, USFWS is seeking the best scientific and commercial information available and is asking the public for scientific and commercial data and other information regarding the two populations of the black-backed woodpecker and their habitat.

158. Comment (Commenter 11): Numerous studies on post-high-severity fire salvage logging have documented adverse effects on the Black-backed Woodpecker and other cavity-nesting bird species (e.g., Saab and Dudley 1998, Hutto and Gallo 2006, Hutto 2006, Hanson and North 2008, Cahall and Hayes 2009, Saab et al. 2007, 2009, 2011). Saab and Dudley (1998) followed 17

Black-backed Woodpecker nests from 1994 to 1996 in forests of western Idaho that burned in 1992 and 1994. Nest densities were more than quadrupled in unlogged stands versus both "standard salvage" and "wildlife salvage" treatments, despite significant snag retention in the treatments. Additional nest monitoring was conducted over subsequent years in the same study site. Saab et al. (2007) reported that nest densities were more than 5 times lower in partially logged burns. Hutto and Gallo (2006) examined nest densities of Black-backed Woodpecker in burned mixed-conifer forest in Montana and documented 10 nests per 148 ha in unlogged burned stands and 0 nests per 275 ha in salvage-logged stands. In the eastern Oregon Cascades, Cahall and Hayes (2009) found that partial salvage logging did not mitigate adverse effects to Black-backed Woodpeckers. In the Sierra Nevada, Black-backed Woodpeckers preferentially foraged in severely burned stands with larger snags and higher snag densities (Hanson and North 2008).

Response: The value of burned forest habitat for black-backed woodpeckers is not in disagreement. Aspects of the proposed action were designed considering this species and the ecological importance of burned forest habitat for this species and other species of wildlife. The Forest Service balances multiple priorities, objectives, uses, and species in its activities as a multiple use agency.

The FEIS (page 283) describes the ecological importance of areas affected by high-severity fire for avian taxa as reported by Saab 2007, Hutto 2008 and others. The DEIS also acknowledged the effects of post-high-severity fire salvage logging on the BBWO (pages 324 to 329) and the Migratory Landbird Conservation Report discloses effects to other cavity-nesting bird species. The FEIS (pg. 328) described that salvage harvesting in black-backed woodpecker habitat would remove approximately 30 percent of the habitat on Forest lands that would become no longer suitable for the black-backed woodpecker but approximately 70 percent would remain. Habitat retention figures, updated in the Black-backed woodpecker report, are similar for the alternative as modified by the Decision.

159. Comment (Commenter 11): The project will degrade black-backed woodpecker habitat and threaten black-backed woodpecker populations, and the analysis fails to incorporate the best available science.

The Project, according to the DEIS and maps, would eliminate and fragment large areas of potential burned Black-backed Woodpecker habitat in the fire area. It is important to note that this is *potential* habitat, as these woodpeckers do not always occur within all parts of a fire area, and the impact of the proposed project on these woodpeckers may be greater than just the simple number of acres affected by logging if the areas slated for logging occur where woodpeckers occur at higher densities. In fact, scientific experts have noted that the high-quality Black-backed Woodpecker habitat – stands with high basal area of larger snags but also with high densities of smaller trees – are often the very same stands targeted for post-fire salvage logging (see, e.g., Dr. Rodney Siegel's comments on the California Department of Fish and Game's status review of the petition to list the Black-backed Woodpecker under the California Endangered Species Act).

Response: See response to Comment 157 and 158 regarding the use of best available science, particularly those that reference the Tingley model and territorial habitat. This model was used to describe territorial pairs and acres of habitat assigned to them. The effects as described in the DEIS analysis recognize the black-backed woodpecker does not occur within all parts of a fire area and depends on the distribution of the species' habitat. Habitat is predictable according to Bond (2012), and can be modelled according to Tingley (2014), depending upon the species' use of foraging and territorial nesting areas, as represented in the maps of modelled habitat in the DEIS. The impact of the proposed project on black-backed woodpeckers may be lesser than

the sum of treatment acres if not all available habitat is occupied. If not all available habitat is occupied then that suggests less than complete saturation and BBWOs may be able to move to areas that are not being salvaged. The best available science is incorporated in the Forest Service analysis (see above comments). The BBWO Report reflects the 2015 survey information that more accurately represents actual distribution. Effects of the proposed action on black-backed woodpeckers will be discussed within the Management Indicator Species Report and black-backed woodpecker reports for this project.

Aspects of the proposed action were designed around this species and the ecological importance of burned forest habitat for this species and other species of wildlife. The referenced Black-Backed Woodpecker Conservation Strategy was considered in the development of the proposed action, however by its very nature, this conservation strategy considers only one species.

160. Comment (Commenter 11): In 2012, The Institute for Bird Populations and California Partners in Flight, commissioned by the U.S. Forest Service, published a Conservation Strategy for the Black-backed Woodpecker in California. Among the management recommendations was the following:

Recommendation 1.5. Avoid harvesting fire-killed forest stands during the nesting season (generally May 1 through July 31). This management recommendation will protect dozens of other nesting bird species associated with burned forests in addition to the Black-backed Woodpecker. After about 8 years postfire, such stands are unlikely to contain many nesting Black-backed Woodpeckers, but many other bird species will nevertheless still be nesting in snags during this period.

The Project makes no effort to refrain from hazard tree removal from May 1 through July 31 anywhere in the project area in 2015, 2016, or 2017. The failure to follow the Black-backed Woodpecker Conservation Strategy with regard to logging in nesting season is of particular concern because it creates an ecological trap scenario (post-fire habitat attracts breeding Black-backed Woodpeckers, whose chicks could be subject to mortality from post-fire logging in nesting season). This effect compounds adverse impacts of post-fire logging on already imperiled Black-backed Woodpecker populations. Post-fire logging of occupied nest sites during nesting season results in the direct killing of chicks that have not yet fledged (chicks that are not mature enough yet to fly away). This is a serious adverse impact that would unnecessarily create significant risks for the viability of Black-backed Woodpecker populations in the Sierra Nevada.

Response: See response to Comment 106 regarding the definition of LOPs with respect to black-backed woodpeckers and other species in general. See response to Comments 151, 155, 156, and 163 regarding the imperilment of the species. Effects to migratory birds have been described in the Migratory Landbird Conservation Report. The proposed project is not expected to cause irreparable or long term harm to any species.

Large areas within the King Fire will be left unsalvaged and snags and snag clusters will be retained within salvaged units. Region 5 analyses (2015) show that 20% of the FS acres that burned from 2007-2014 and are suitable for black-backed woodpecker have been, or are proposed to be treated with post-fire tree removal including the proposed King Fire Restoration Project. Estimates for all lands (regardless of landowner) show that a maximum of 35% of the acres that burned in the range of the black-backed woodpecker in California from 2007-2014 have been, or are proposed to be treated with post-fire timber removal (of which 20% occur on FS lands). This value for treated acres on all lands is likely an overestimate because it includes the assumption that all “other lands” (non-FS and non-NPS) are harvested following a fire.

Forest Plan direction following large, catastrophic disturbance events provides guidance for multiple forest management objectives, including economic recovery of fire-injured trees, reducing the potential for soil erosion, and maintaining critical wildlife habitat (SNFPA ROD, pp. 52-53). The proposed action strives to strikes a balance between multiple use objectives and species-specific habitat considerations.

161. Comment (Commenter 11): The Forest Service commissioned me other Black-backed Woodpecker experts to write the Conservation Strategy for Black-backed Woodpecker populations in California. This Strategy includes a set of recommended conservation measures to avoid a serious risk to the viability of Black-backed Woodpecker populations. The DEIS not only does not incorporate our conservation recommendations, but also does not meaningfully analyze the adverse impacts, and cumulative effects, to Black-backed Woodpecker populations that will result from the failure to follow the conservation recommendations.

Response: See response to Comments 106, 157 (regarding Conservation Strategy and other research), 152, 153, 155 (regarding cumulative effects) and 160 (FS Plan direction and project mitigations benefiting the woodpecker). The purpose of the conservation strategy for the black-backed woodpecker "is to provide a roadmap for conserving Black-backed Woodpeckers in California through informed management." (Bond et al. 2012, p. 1). It seeks to summarize known information about the species, recommends management approaches for conservation, and suggests future research priorities (pp. 1-2). It is not Forest Service guidance or direction, and it is not a regulatory document. Thus the Forest Service is not legally bound to follow the recommendations in the strategy. The Conservation Strategy was considered in the development of the alternatives and used in the analysis of the effects of those alternatives. The analysis incorporates the conservation recommendations and analyzes the project's potential to impact and cumulatively effect the BBWO.

Several project specific examples where the purposes and needs of the project were balanced with needs for maintaining newly created shrubland habitat (described by the commenter as complex early seral forest) as well as burned snags throughout the Project Area include: (1) salvage units being dropped or modified in Alternative 3 based on preliminary analysis of available potentially suitable habitat; (2) snag retention guidelines developed to provide a measure of snag forest habitat connectivity through the salvage units; (3) salvage harvest not allowed in riparian buffers; and (4) inclusion of inoperable areas within treatment units that would not be harvested. Although these measures would not eliminate all potential adverse impacts of the proposed action on snags in burned forest habitat represented by the black-backed woodpecker (e.g., habitat loss and fragmentation), they would mediate these effects to some extent.

162. Comment (Commenter 11): New scientific evidence suggests that there may be a genetic distinction between the eastern Oregon Cascades population of the Black-backed Woodpecker and the California population (Siegel et al. 2013). While the degree of this distinction is still being analyzed, this new information indicates that the combination of the current post-fire logging projects presents potentially serious unknown and uncertain risks by severely reducing and fragmenting suitable habitat in a population that may be even smaller and more isolated than previously assumed. The fact that there may be a genetic distinction between Oregon and California (Siegel et al. 2013) indicates that the discontinuities and gaps in habitat between the two populations are already significant.

Response: The commenter is referencing preliminary genetic analysis of Black-backed Woodpeckers (Picoides arcticus) from Lassen and Plumas National Forests, presented in Siegel et al. 2013. More data is required regarding genetic distinction between Oregon and California black-backed woodpecker populations as these are preliminary results

See also response to Comment 155, 157, and 163 regarding the issue of imperilment.

The California Fish and Game Commission ("Commission"), at its November meeting in La Quinta, California, made a finding pursuant to Fish and Game Code section 2075.5, that the petitioned action to add the California population of the black-backed woodpecker (Picoides arcticus) to the list of threatened or endangered species under the California Endangered Species Act ("CESA") (Fish & G. Code, § 2050 et seq.) is not warranted. (See also Cal. Code Regs., tit. 14, § 670.1, subd. (i).) The Commissions conclusion that the black-backed woodpecker was based on a summary of listing factors by Bonham (2013)

Having considered all factors, it was concluded that the best available scientific information available to the Department does not indicate that the black-backed woodpecker's continued existence is in serious danger or is threatened by any one or any combination of the following factors found in relevant regulation: present or threatened modification or destruction of black-backed woodpecker habitat, overexploitation, predation, competition, disease, or other natural occurrences or human-related activities. (Cal. Code Regs., tit 14, § 670.1 (i)(1)(A)). Therefore, based upon the best scientific information available to the Department, listing the California populations of the black-backed woodpecker as threatened or endangered was not warranted.

163. Comment (Commenter 11): The Black-backed Woodpecker is under intensive scrutiny, and scientists and conservationists have expressed grave concerns about the future of these birds. The Oregon/California population of the Black-backed Woodpecker is being considered for listing under the federal ESA. The onus is on the Forest Service to demonstrate that this logging project will not reduce important habitat and adversely affect the local and regional populations of these species to the point where listing becomes necessary.

Response: While some scientists and conservationist have expressed concern about the future of BBWO there is no credible evidence supports the claim that the BBWO is facing a major threat of extinction.

On April 9, 2013, the U.S. Fish and Wildlife Service (USFWS) concluded that listing the Oregon Cascades-California and Black Hills populations of the black-backed woodpecker as distinct population segments or subspecies may be warranted (USFWS 2013; 78 FR 21086). This finding does not mean USFWS has decided to give the black-backed woodpecker Federal protection under the Endangered Species Act. Rather, the Agency is embarking on the first step in a longer process that triggers a more thorough review of the species. In this review, USFWS is seeking the best scientific and commercial information available and is asking the public for scientific and commercial data and other information regarding the two populations of the black-backed woodpecker and their habitat.

The California Fish and Game Commission ("Commission"), at its November meeting in La Quinta, California, made a finding pursuant to Fish and Game Code section 2075.5, that the petitioned action to add the black-backed woodpecker (Picoides arcticus) to the list of threatened or endangered species under the California Endangered Species Act ("CESA") (Fish & G. Code, § 2050 et seq.) is not warranted. (See also Cal. Code Regs., tit. 14, § 670.1, subd. (i).) The Commissions conclusion that the black-backed woodpecker was based on the following summary (Bonham 2013):

- The lack of an apparent range retraction or changes in distribution within the range.

- The episodic cycles of high density occurrences (i.e., prey invasion, high woodpecker productivity, prey decline, and woodpecker dispersal) and the lack of current data on the cycle's impact on the long-term viability of California's black-backed woodpecker population.
- The lack of data concerning the role of green forest on the species but its apparent use as habitat.
- The trending increase in fire frequency, size, and severity as compared to the early and mid-20th century.
- Uncertainty regarding the magnitude of the threat posed to black-backed woodpeckers by post-fire salvage logging.
- Lack of logging on approximately 80 percent of severely burnt USFS forest habitat since 2003 (i.e., 87,200 acres).
- The ongoing long-term monitoring of the species as an MIS.
- Black-backed woodpecker populations in California are not geographically isolated from populations in adjacent states.

Having considered these factors, the Department concluded that the best available scientific information available to the Department does not indicate that the black-backed woodpecker's continued existence is in serious danger or is threatened by any one or any combination of the following factors found in relevant regulation: present or threatened modification or destruction of black-backed woodpecker habitat, overexploitation, predation, competition, disease, or other natural occurrences or human-related activities. (Cal. Code Regs., tit 14, § 670.1 (i)(1)(A)). Therefore, based upon the best scientific information available to the Department, listing the black-backed woodpecker as threatened or endangered is not warranted.

Moreover, the IUCN Red List of Threatened Species evaluated the black-backed woodpecker as a species of "Least Concern" in 2012 (http://www.iucnredlist.org/details/22681181/0). IUCN provided justification for this evaluation as follows: "This species has an extremely large range, and hence does not approach the thresholds for Vulnerable under the range size criterion (Extent of Occurrence less than 20,000 km2 combined with a declining or fluctuating range size, habitat extent/quality, or population size and a small number of locations or severe fragmentation). The population trend appears to be stable, and hence the species does not approach the thresholds for Vulnerable under the population trend criterion (greater than 30 percent decline over ten years or three generations). The population size is extremely large, and hence does not approach the thresholds for Vulnerable under the population size criterion (less than 10,000 mature individuals with a continuing decline estimated to be greater than 10 percent in ten years or three generations, or with a specified population structure). For these reasons the species is evaluated as Least Concern". Under the Nature Serve conservation ranking system, the species has been categorized as secure at the global scale and apparently secure at the national scale. The species has recently been categorized as imperiled at the State scale, but this ranking is currently being reevaluated by the state (Patrick McIntyre personal communication). The Forest Service has collected considerable information by partnering with non-governmental organizations to complete monitoring within fire areas since 2008. Since none of this data was considered in the July 31 status decision, a review is of this information is now being conducted and may alter the July 31 decision. The black-backed woodpecker was evaluated by subject matter experts for the potential inclusion on the Region 5 Forest Service Sensitive Species list (final list updated on July 3, 2013), but the evaluation did not result in adding this species to the Regional Foresters Sensitive Species list (July 3, 2013 Letter from Regional Forester).

164. Comment (Commenter 11): Science-based recommendations for management of Black-backed Woodpecker habitat (Bond et al. 2012) were not incorporated into design of the Project.

This lack of regard for the needs of wildlife when planning where and when to conduct salvage logging will result in adverse short-term and long-term effects on the many species of wildlife that are associated with the fire-killed trees within severely burned stands of the fire. There has been a large body of scientific literature produced over the past decade on the impacts of fire and insects on native wildlife species and habitats, as well as on fire-risk reduction and post-fire salvage logging that directly refutes the need for post-fire salvage logging. Disturbances such as high-severity fire and insect outbreaks are natural and important elements of healthy forests in the western U.S. and Canada and post-fire salvage logging adversely impacts soils, vegetation, and wildlife of the Complex Early Seral Forest. Therefore, I recommend that logging not occur in Black-backed Woodpecker nesting season, and that tree felling occur outside of nesting season and be limited to roads truly necessary for public use, and limited to dead trees that could actually hit the road if they fell.

Response: See response to Comment 106, 157 (regarding Conservation Strategy, LOPs and other research), 152, 153, 155 (regarding cumulative effects) and 160 (FS Plan direction and project mitigations benefiting the woodpecker). See response to Comments 151, 155, 156, and 163 regarding the imperilment of the species. See 157 regarding scientific literature. See response to Comment 162 and 163 regarding ratings by other agencies and scientific groups regarding the species status.

The Forest Service considered habitat characteristics important to black-backed woodpecker as described in the Conservation Strategy (Bond et al. 2012) and the Tingley et al. (2014) model when determining effects to black-backed woodpeckers. Detailed analysis of the potential direct, indirect, and cumulative effects to black-backed woodpeckers were analyzed for each alternative and are available in the BBWO Report.

By its nature, the black-backed woodpecker Conservation Strategy only considers one species. However the Forest Service has to balance multiple priorities, objectives, uses, and species in its activities as a multiple use agency. And, at times, certain management objectives are in tension, if not direct conflict, with one another. For example, through this Project, the Forest seeks to reduce fire hazard by removing burned trees; yet, the Forest also wishes to conserve burned forest habitat for the black backed woodpecker and other species. The Forest has worked to strike a reasonable balance between these two goals at the landscape level, but it is simply impossible to fully achieve both of these goals on each and every acre. The need to balance multiple priorities is acknowledged by the Conservation Strategy (Bond et al. pg. 44)

The Forest Service agrees disturbances such as high-severity fire and insect outbreaks can be natural and important elements of healthy forests in the western U.S. however, as in the case of the King Fire, fire effects that are outside of the NRV for the forest types affected, can have a long lasting negative effect to multiple forest resources.

Commenter 21 – Response to Comments

Ecology and Restoration

165. Comment (Commenter 21): The DEIS fails to recognize and support (support means active fire use) the ecological values of Complex Early Seral Forests.

Response: The Sierra Nevada Forest Plan Amendment Record of Decision (USDA 2004) provides for ecosystem restoration following large, catastrophic disturbance events. Restoration activities may be conducted in all land allocations and include objectives for managing disturbed areas for long-term fuel profiles, restoring habitat, and recovering the economic value

of some dead and dying trees. Restoration projects can include salvage of dead and dying trees for economic value as well as for fuels reduction (USDA 2004, p. 6).

The Forest agrees that there are ecological values to complex early seral habitat and therefore project alternatives propose to retain different levels of complex early seral habitat across a gradient of early seral coniferous conditions. As described on pg. 107 of the FEIS:

"The amounts of multi-structure early seral conifer forest maintained in the various alternatives ranged from 35-41% of the high severity conifer/mixed hardwood conifer patches."

166. Comment (Commenter 21): The level of disturbance now occurring in the perimeter of the King Fire on private timber lands will result in widespread elimination of native species and ecological processes. Similar actions by the Forest Service, while not as extreme, will add cumulatively to the destructive load that the region has had to bear. Recovery of wildlife species in the area is dependent upon food and habitat, which nature provides in abundance in herb, shrub, and hardwood regeneration. It is likely that the proposed activities will instead compromise the viability of many native plant species within the fire perimeter.

Response: According to direction in FSH 1909.15_10_15.1 cumulative effects must be considered and analyzed without regard to land ownership boundaries or who proposes the actions. Consideration must be given to the incremental effects of the action when added to the past, present, and reasonably foreseeable related future actions of the Forest Service, as well as those of other agencies and individuals, that may have a measurable and meaningful impact on particular resources.

Cumulative effects to wildlife and other resources are analyzed in Chapter 3 of the FEIS and include the impacts of harvesting on private land in addition to the proposed project activities. Analyzed activities on private land were cautiously overestimated by assuming all conifer forest types on private land that burned within the King Fire would be salvage harvested and that they would be reforested if basal area mortality was greater than 50%. In practice many areas where green trees are remaining on private lands, no salvage activities are occurring.

167. Comment (Commenter 21): Loss of Species from Disturbance is not Sustainable in Today's Changing Climate.

In the Sierra Nevada, resilience to climate change is best arrived at by allowing fire to regulate structure and succession (Hurteau and North 2010). Science affirms the importance of allowing natural succession to take place to maximize climate change adaptation and resiliency. A 2010 literature review by Thompson et al. (2010), co-authored by the Forest Service, concluded:

> "The ecological stability, resistance, resilience, and adaptive capacities of forests depend strongly on their biodiversity. The diversity of genes, species, and ecosystems confers on forests the ability to withstand external pressures, and the capacity to 'bounce back' to their pre-disturbance state or adapt to changing conditions."

Ecologically healthy and resilient landscapes, rich in biodiversity, will have greater capacity to adapt and thrive in the face of natural disturbances and large scale threats to sustainability, especially under changing and uncertain future environmental conditions such as those driven by climate change and increasing human use.

Response: The Forest agrees that ecologically healthy and resilient landscapes, rich in biodiversity, will have greater capacity to adapt and thrive in the face of natural disturbances and large scale threats to sustainability, especially under changing and uncertain future environmental conditions such as those driven by climate change and increasing human use. However as described on page 4 of the FEIS "The King Fire burned large areas of the Eldorado National Forest so severely that active management is necessary to put such areas on a trajectory toward improved conditions." Analysis of Alternative 1 in Chapter 3 of the FEIS shows effects of natural succession without further management action. Furthermore, section pg. 55 of the FEIS discusses climate change and greenhouse gasses. "Climate change increases the uncertainty of US forests' ability to serve as a 'sink' for carbon storage, but management options exist that could buffer the impacts of climate change on forests, and even lead to increased forest carbon storage potential." The FEIS assess the associated risks and vulnerabilities for the natural and human communities. The FEIS (pgs. 108 and 109) further describes that "forest landscape structure will become gradually more coarse-grained as fire frequency and severity continue to increase and fire suppression efforts continue to lead to forest densification in the rest of the landscape. In all alternatives it is likely that a high proportion of early-seral forests will occur on the landscape as future climate causes increased fire severity and frequency." In order to further analyze for climate change, alternatives, avoided resilience treatments (salvage harvest and reforestation) in areas that may be unsustainable as future conifer forest based on bioclimatic modelling discussed in King Fire Vegetation Resilience and Restoration Assessment (Appendix B of the FEIS).

Natural Range of Variability

168. Comment (Commenter 21): The concept of NRV is erroneously being used to justify salvage logging and industrial reforestation, activities that result in forest conditions that have no natural analog and move the landscape further outside of NRV.

We agree that day-4 of the King Fire likely burned outside of NRV, creating high severity burn patches that would likely not have occurred if not for the past 100+ years of fire suppression and historical logging practices. However, it is irrational to conclude that because a portion of a fire burns outside of NRV it is necessary to implement salvage logging and reforestation practices that create conditions not known in nature. The DEIS suggests that Alternative 3 "maintains larger areas outside of NRV for high-severity patch size than Alternative 2;" however, this is a false dichotomy. It was the King Fire that created high severity patches outside of NRV, not the proposed alternatives; therefore, the appropriate NRV analysis would be to determine which of the alternatives result in conditions that are most within NRV.

Response: The concept of NRV in relation to patch size was used to identify and prioritize locations for reforestation with the expectation that patches that had patch sizes that were within NRV would be more likely to reforest and recover without planting efforts, even though it is recognized that additional treatments may be needed to maintain or trend stands toward desired conditions. As described on page 2-2 of the DEIS:

"*The ability of forests to regenerate after stand replacing fire is highly dependent on seed sources. Larger patches can create openings larger than available seed from neighboring surviving conifers can reach (Bonnet 2005). Areas that have experienced high-severity fire have been shown to have dramatically lower regeneration rates for conifers and especially for pines compared to areas burned at moderate or low severity (Crotteau et al. 2013). Seed dispersal generally occurs within one to two tree heights, or 60 meters (200 feet), and long distance dispersal has been documented at 400 meters (1,300 feet) (Bonnet et al. 2005;*

Bohlman 2014). Areas that were likely to naturally regenerate were determined using a statistical analysis. Since it is more likely that areas adjacent to unburned and low-severity fire would have theoretically more seed sources, these were given a higher ranking than moderate severity fire. Using a 100 meter (328 feet) estimate of seed dispersal, a spatial map was created showing the locations in high-severity patches where natural regeneration had a high probability of success in the next decade. These areas were then identified as sites that would be monitored for natural regeneration."

Planting of seedlings is proposed where a forested community is the desired condition, but where natural regeneration of a desired species composition and density are not expected to occur within the next several decades, and stands can reasonably be effectively and efficiently managed into the future. Planting strategies have been designed to maintain ecological integrity while balancing future climate projections, economics, long-term management feasibility, and desired conditions.

In addition to reestablishing forest stands, purpose and need elements for salvage logging include fire and fuels management and human safety. As further described on page 9 of the FEIS: "High fire severity patches that were less than 10 acres in size were excluded from analysis for vegetation treatments other than those associated with hazard trees or of strategic fire management zones."

While the King Fire created the high severity patch outside of NRV, the "action alternatives break up the continuity of the high-severity patches (page 107 of the FEIS)" through proposed treatments and therefore result in conditions that are closer to NRV. Table S.2 in the same section quoted by the commenter identifies that Alternative 2 is "Closer to NRV conditions for maintenance of high-severity patch size".

169. Comment (Commenter 21): Alternatives 2, 4, and 5 immediately salvage log, use herbicides to kill native colonizing and sprouting vegetation, and plant trees in a manner that creates dense even-aged forests, all of which create forest structures, forest compositions, species diversity, and species abundance that are not known to occur in nature; therefore it is Alternatives 2, 4, and 5, not Alternative 3, that maintain larger areas that are outside of NRV. All efforts should be made to return the forest to a condition that is consistent with natural forest stands and Alternative 3 is the action alternative that comes closest to doing so.

Response: "Compared to NRV, current mixed-conifer stands in the King Fire are generally characterized by: 1) a greater proportion of high-severity fire, 2) a lower proportion of low and moderate fire, 3) larger patches of high-severity fire, 4) departure from the pre-European fire return intervals, and 5) a greater amount of early-seral conditions" (FEIS, pg. 101)

As described on page 204 of the FEIS: "Severe fire may induce type conversions that may not have occurred had the forest been in a more resilient condition (Collins and Skinner 2012). Large areas of greater than 90 percent basal area loss are likely to revert from forests to shrub fields that are outside of the NRV for current fire regimes and climatic condition (Beaty and Taylor 2008; Nagel and Taylor 2005)."

As described on pages 15 to 16 of the FEIS: Planting strategies using variable density planting designs that take into account landscape positions have been designed to maintain ecological integrity while balancing future climate projections, economics, long-term management feasibility, and desired conditions.

170. Comment (Commenter 21): For millennia the primary natural disturbance agent that created CESF in the yellow pine and mixed conifer (YPMC) forests of the Sierra Nevada was mixed severity fire. Many studies suggest that these forests were not characterized by large stand-replacing disturbance events, but rather frequent low and moderate severity events. However, studies on the subject suggest that, on average, 5 to 15 percent of any given fire within Sierra Nevada YPMC would have burned at high severity; and Sierra-wide, approximately 15 to 20 percent of the YPMC would be in an early seral condition (Safford 2013). While we understand that the amount and patch sizes of high severity burned forest within the King Fire are far greater than would have likely occurred under a natural fire regime in an unlogged forest, having too much high severity fire suggests that the amount of moderate and low severity burned forest within the King Fire is far less than would have occurred under a natural fire regime. As mentioned above, there has been little fire on this landscape since 1908 (DEIS 3-53) resulting in high severity effects.

Response: As discussed on page 104 of the FEIS the entire fire was still heavily weighted toward high severity (47%).Table 3EC.2 (page 109) shows that the amount of low and moderate severity fire is less than what would have occurred under NRV. Unchanged areas were within NRV, but on the low side.

Fire and Fuels

171. Comment (Commenter 21): The proposed action and the fire and fuels modeling analysis did not consider the use of prescribed fire to manage fuels across the landscape at any time in the future, despite this being a foundation of our scoping comments and fundamental to restoring mixed conifer forests of the Sierra Nevada forests.

Response: Purpose and need element 2 describes the need for the project to: "Strategically located fire management areas facilitate the effective suppression and control of unwanted future fires and provide control lines for the application of future prescribed fires in the project area"(FEIS, pg. 4). In addition to the prescribed fire treatment proposed on 2,841 acres in the Rubicon Canyon with this project the "Fire Management Strategy within the King Fire" (Appendix C) provided a landscape strategy for planned and unplanned ignitions in the King Fire. As described on page 10 of the FEIS:

"*The strategy was designed to be dynamic so that as new science and planning documents become available, updates can be made to reflect these on the landscape. The strategy strives to provide: 1) resilient forest vegetative communities to predictable occurrence of future fires, 2) sustainable habitat for native biotic communities, and 3) reduce the risk of large-scale disturbances that have the potential to impact communities, watersheds, and ecosystems. All areas within the landscape that met the planning criteria were identified as either Strategic Fire Management Zones (SFMZ) designed to contain wildfires and facilitate prescribed fire, or Wildland Urban Interface (WUI) defense zones where the focus is on protecting life and property. Additional areas were also identified that would be potential candidates for the reintroduction of fire within the next five years*."

Furthermore planting configuration and release treatments were designed to facilitate prescribed fire treatments in the near future (10-15 years) as described on page 10 of the FEIS.

172. Comment (Commenter 21): Although we are pleased to see the inclusion of 2,841 acres of prescribed fire in all of the action alternatives, this is less than 5% of the Forest Service lands burned by the King Fire. We are extremely disappointed that prescribed fire is not being consider more extensively as a management tool to maintain reduced fuel conditions in any areas outside of the Rubicon Canyon within the next 10 years, despite this being a central theme in nearly all current fire science and was the basis of our scoping comments. Nowhere in the document, that we can find, do you address the use of prescribed fire to treat fuel accumulations over the coming decade across the landscape. It appears your view of the purpose of the SFMZs is primarily for fire suppression purposes, otherwise, you would have analyzed the use of the SFMZs as anchors to conduct prescribed fire to treat fuel accumulations in unsalvaged areas in the fire and fuels analysis. In our scoping comments, we requested that you develop and analyze the effects of beginning a long-term landscape-wide fire and fuels management strategy based on the use of prescribed fire to bring about fire-landscape realignment, but you did not include such a plan in spite of the recommendation of your own fire staff. If you had done this, the fuel accumulation models in your fire and fuels analysis would certainly have had different results. There is almost universal agreement among forest ecologists and fire scientists that increasing the pace and scale of prescribed fire in the Sierra Nevada is the only way to reach true landscape resiliency and provide ecological integrity. This was your chance to develop and begin to implement a landscape-wide fuels management strategy. You did not do this or attempt to do this and most of our scoping comments and the literature we cited related to this theme have been ignored.

Response: Purpose and need element 2 describes the need for the project to: "Strategically located fire management areas facilitate the effective suppression and control of unwanted future fires and provide control lines for the application of future prescribed fires in the project area"(FEIS, pg. 4). SMFZ were designed not only for fire suppression, but for large landscape scale prescribed fire units. The "Fire Management Strategy within the King Fire" (FEIS Appendix C) provides a landscape strategy for planned and unplanned ignitions in the King Fire. The Fire Management Strategy identified use of future prescribed fire as an important management tool in this area. Strategic fire management areas designed to support prescribed fire units using ridgetop units to facilitate landscape scale prescribed fire units in the future. Prescribed burning in many areas of the King fire are not within a reasonable planning timeframe or do not meet the stated purpose and need of the project, however the King Fire project will facilitate and not preclude future treatment with prescribed fire. For example, the South Fork Cohesive project is current in the process of being planned and will include some prescribed fire based on King Fire SFMZ units. The King Fire project will facilitate prescribed fire by removing large fuel loads and removing snags prior to allow safe implementation. By combining mechanical work with future prescribed burning, it is possible to treat more areas in less time, while successfully achieving multiple resource management objectives.

173. Comment (Commenter 21): Home and Community Protection in Frequent Fire Forests--Not an Excuse to Override Ecological Integrity.

The King Fire DEIS should call on homeowners to take seriously the State mandated fire clearance requirements in (PRC 4291-4299) for home protection which is the responsibility of homeowners living in fire-prone forests (Cohen 2008). The home ignition zone, which is the relationship between a structure and its surroundings, is where fire protection should start. All community fire safety programs (Fire Safe; Fire Wise Communities, USA; Community Wildfire Protection Plans) start with an understanding that home protection starts with the home and works out from there. While it is important that the Forest Service prioritize fire hazard reduction

nearest to communities, the homeowner and community in forested landscapes have their own responsibilities.

"Wildfires are inevitable but the destruction of homes, ecosystems and lives is not" states Forest Service-Rocky Mountain Research Station fire scientists (Calkin et al. 2014). The fire behavior specialists have spent decades examining home ignition criteria, fire and weather interactions and the socio-cultural ramifications of increased WUI development and public perceptions regarding wildfire. The authors point out, there is not a wildfire control problem in the WUI, there is a home ignition problem determined by home conditions. In what the researchers call the "wildfire paradox" is the fact that by "using fire suppression to eliminate large and damaging wildfires ensures the inevitable occurrence of these fires." As an alternative, the authors emphasize strategic risk assessment to reduce home ignition potential. This activity is where the Forest Service should focus in working with communities and fire safe councils adjacent to the Eldorado National Forest.

Fire Wise Communities, USA is a national program that includes significant public-private collaboration in support of community fire protection. In approximately 2010, Sierra Forest Legacy became trained Fire Wise Community certifiers for the central Sierra Nevada. Certification included training in home protection techniques at the community association level and it empowered community members to take responsibility for the choices they have made to live in frequent fire forested environments. Part of that experience was to encourage homeowners to create defensible space and a Fire Wise home environment that could survive fire without fire engines or fire-fighter support.

http://www.sierraforestlegacy.org/CF_CommunityProtection/FirewiseCommunities.php

The home ignition zone principally determines a home's ignition potential. The zone includes the home in relation to its surroundings within 100–200 feet of the home.

Figure 1 Figure above from Jack Cohen (2008) Forest Service, Rocky Mountain Research Station

We bring this issue up because we are concerned that due to political pressure the Forest Service is over-reacting in the south fire area FMZ by taking unnecessary measures to fire proof this area. This action is an unwarranted over-reach that sets an ecologically damaging precedent in terms of treatment widths and intensity of FMZs while exempting the local residents from the burden of personal responsibility when living in a fire prone, forested environment. Fire-wise homeowner measures, and reestablishing frequent fire use is the long term solution to reduced fuel loads and community protection. Fire suppression and fire exclusion is the reason some of the unfortunate homeowners lost their dwellings. All of the fire protection impacts should not fall on public lands and their ecological integrity.

There are several misconceptions regarding the public's perception of fuels treatments, their effectiveness and the longevity of their effectiveness. In Reinhardt et al. (2008) the authors state plainly that the "wildlands cannot be fireproofed" but instead should be made resilient to fire.

They recommend efforts should focus on reducing fire severity and intensity but not fire occurrence. This is consistent with our recommendations and the fire staff recommendations for the King Fire restoration project. The condition is called FIRE-LANDSCAPE REALIGNMENT.

Response: The Responsible Official will consider this recommendation when making his decision. The Forest Service agrees that there is a need for home owners to manage flammable fuels in and around their homes to reduce the loss of homes to wildfire in the WUI. In the studies cited by the commenter, authors emphasize the need to manage the flammability of homes and their surroundings to reduce loss in the Wildland Urban Interface. However, authors also acknowledge that landscape condition cannot be ignored to realize fire-adapted communities because, by definition, WUI communities consist of more than homes. The wildland component defines the environmental context and values for communities, including views, recreation, watershed, and lifestyle benefits to the inhabitants. Practices that save all homes from wildfire but ignore severe impacts to the surrounding landscape cannot be wholly successful in creating a fire-adapted community In fact, wildland values may be harder to restore, take longer, and be more expensive than reparations to the developed infrastructure. Thus, the goal of creating a fire-adapted WUI community is not achievable by focusing solely within the home ignition zone, but must encompass the land management options afforded by the ecological requirements of the wildland ecosystems. Low-elevation forests are amenable to treatments that supplement the ecological dependency on fire and also mitigate effects and spread of wildfires under extreme conditions (Calkin et al (2014).

174. Comment (Commenter 21): In a study of the effects of fuel reduction in plantations that burned in the 2008 American Complex Fire on the Tahoe NF, FS ecologist Hugh Safford reported that plantations with medium to high cover of live shrubs mostly survived fire (Safford 2008). This effect has been reported by firefighters for years, but is rarely documented. Weatherspoon and Spooner also reported in 1995 that grasses were the major contributor to high losses in plantations, along with the conifers themselves, versus shrubs which had the least contribution. It should also be noted that during the King Fire, 12 firefighters saved their lives when guided by a helicopter pilot above them to a stand of manzanita, where they were able to deploy their fire shelters and the fire dropped away. Manzanita is surprisingly fire resistant when it is alive and green, whereas dead shrubs, killed by herbicide, are simply more fuel.

Response: Herbicide treatments proposed in the project would be conducted when shrubs are small, leading to lower fuel accumulations and height of fuel beds compared to live shrubfields

or shrubfields where shrubs are not treated until they mature. The ENF agrees that live fuel moistures during springtime and green-up conditions such as that experienced during the June 20, 2008 lightning event in northern California are in some cases high enough to be a heat sink in brush vegetation types. The American River Complex fire burned through extremely complex topography, under mostly moderate weather conditions and relatively high ambient and fuel moisture conditions (Safford 2008). Overall fire severity was primarily low to moderate, with most of the high severity effects occurring on a single day when temperatures and wind speeds rose and humidity dropped (Safford 2008).

Three years of drought combined with hot and dry weather have resulted in low live and dead fuel moistures, leading to extreme fire behavior during the King Fire (Predictive Services, Fuels and Fire Behavior Advisory for Northern California, July 23, 2014). Fire management on Eldorado National Forest monitors live fuel moistures across the forest each year and periodically compiles the information to inform local and incoming fire fighters of the existing conditions and expected fire behavior. ENF Fuels Assessment dated July 7th states that weather and fuel conditions were at mid-August conditions. The report continues to explain how the live fuel moistures in Manzanita brush were decreasing. As of July 7th, 2014 the manzanita fuels were transitioning from a heat sink into a heat source. Fire and fuels staff observed much of the older growth manzanita leaves are turning yellow/brown and falling off the brush, an indicator of manzanita entering dormancy. The September 1, 2014 assessment states the live fuel moistures in Manzanita brush are predominately < 100% below 5000 feet and 125% > 6000 feet and pockets of brush mortality continues to increase across the forest. When live fuel moistures in brush at or less than 30% they are treated as if they are dead.

According to the CalFire Green Sheet for the King Fire Shelter Deployment on July 15, 2014, the fire crews deployed shelters at the head of a drainage where a crown fire had made a run toward them. The fuel type in the vicinity of the fire shelter deployment site was mixed conifer with heavy dead and down fuels. The fire crews survived one extreme fire behavior run while in the deployment site. However, the helicopter pilot noticed the re-burn potential and a second crown fire making a push toward the crews at the deployment site. The site was not survivable due to the location and the fire was in alignment with slope and wind which contributed to the development of a sustained crown fire. The deployment site was not located in a manzanita field.

Figure Photograph of deployment site from Calfire Green Sheet for Shelter Deployment on September 12, 2014.

Type II helicopters typically need a landing pad 20 feet x 20 feet, a safety circle of 90 feet and a flight path approximately 300 feet for take-off and landing (NWCG, IRPG page 50-51, January 2014). The helicopter pilot lead the fire fighters to an acceptable landing zone in order to safely land and extract the fire crews (CalFire Green Sheet King Fire Shelter Deployment September 2014).

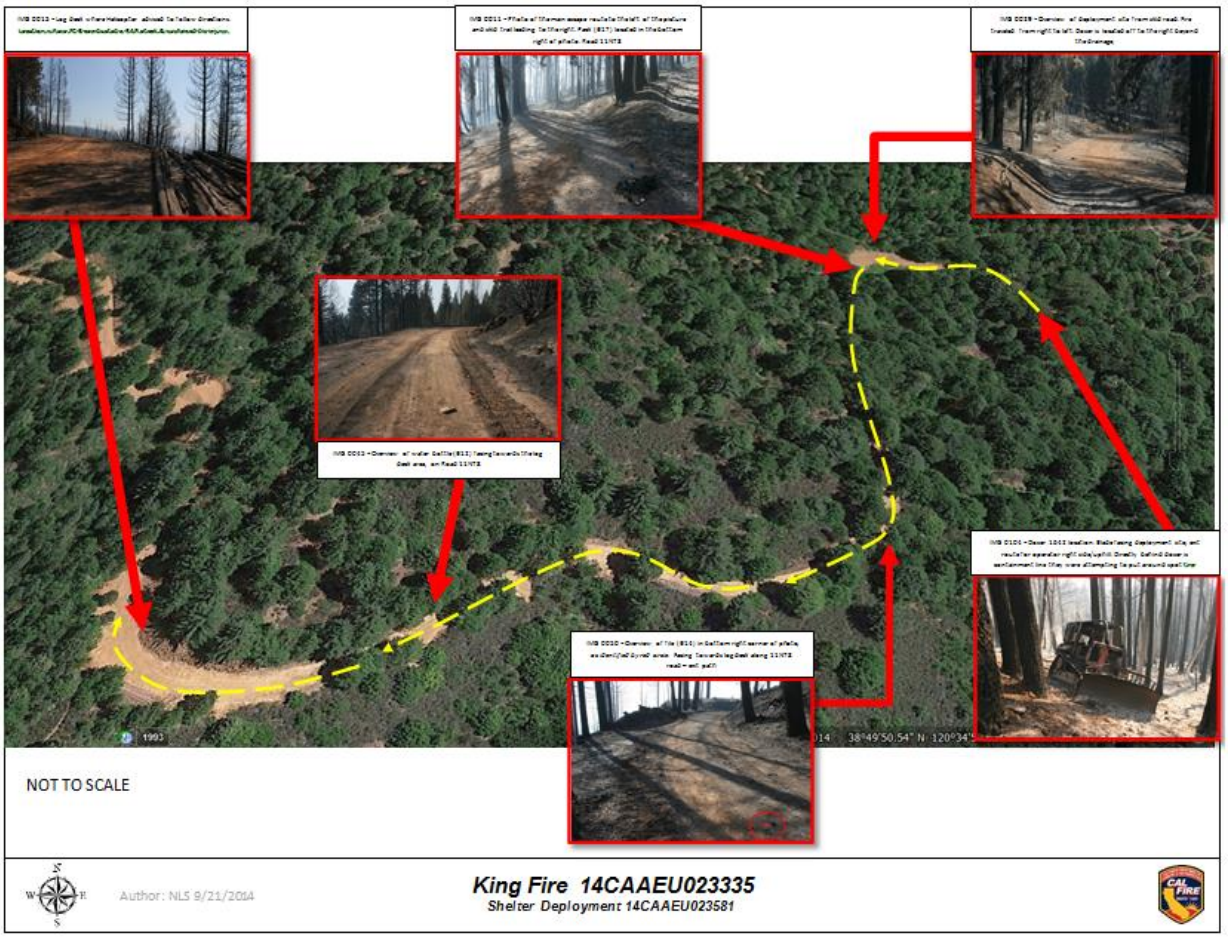


Figure Picture of the dozer burn over site and shelter deployment sites on right side of photo and escape route leading left for firefighters deployed on September 12, 2014 from the CALFIRE Green Sheet.

Fuels Reduction

175. Comment (Commenter 21): Salvage of low and moderate severity burned forests is unnecessary and antithetical to the concept of forest restoration.

Response: Low and moderate fire severity patches were excluded from analysis for vegetation treatments other than those associated with hazard trees or of strategic fire management zones.

176. Comment (Commenter 21): The Forest Service spends millions of dollars a year in the name of creating resilient forest conditions and uses the concept of NRV to justify many actions taken in the name of forest restoration. Despite this, across the project area, Alternative 2 treatments would occur on 4,388 acres considered to be within NRV (DEIS, page 3-256). Tree mortality is a requirement of mixed severity fire, a disturbance regime the mixed conifer forests of the Sierra Nevada are adapted to. There is no debate that all areas burned in the King Fire at low and moderate severity are within NRV. When portions of fires burn within NRV, the resulting conditions are, by definition, "desired." Desired conditions already met should not require any immediate management action, other than those activities deemed necessary to protect life and property (i.e., roadside hazard tree removal). These areas should be considered "treated" from a

fuels and forest restoration perspective, and the only future management activity that should be planned in these areas within the next 10 to 20 years is the use of prescribed fire to maintain resiliency. As such, we ask that you do not conduct salvage logging or biomass removal in any area that burned at low and moderate severity, except for hazard tree removal.

We contend there can be no legitimate ecological justifications to salvage log areas that burn within NRV. We also contend there can be no legitimate economic justification to salvage log areas that burn at low and moderate severity given the great lengths the Forest Service goes through to conduct prescribed burns and mechanically treat areas in the name of forest restoration and mimicking the natural disturbance process to which these forest have adapted, mixed severity fire.

Response: Low and moderate fire severity patches were excluded from analysis for vegetation treatments other than those associated with hazard trees or of establishing strategic fire management zones as described in the purpose and need.

Modeling and Analysis

177. Comment (Commenter 21): The fire and fuels modeling analysis, by design, is inherently biased in support of salvage logging.

There are two fundamental flaws with the DEIS fire and fuels analysis: (1) the analysis does not consider that any fuels management activities will occur within the next 50 years, except for plantation management, despite it being a foundation of our scoping comments that you include the landscape-wide use of prescribed fire as part of the proposed project; and (2) the effects of vegetative regrowth and reforestation on fire behavior were only modeled 10 years into the future, while fuel loads without vegetative regrowth were modeled 50 years into the future, creating results that are inherently biased in support of salvage logging and reforestation.

The DEIS models fire behavior and fuels accumulations 50 years into the future to suggest that salvage logging is necessary, but does not consider or analyze the effects of prescribed fire as a tool to reduce fuels in any area, including the proposed 2,841-acre prescribed fire in the Rubicon Canyon.

Response: FEIS page 144: "The direct, indirect, and cumulative effects analyses are based on a temporal scale. Existing conditions represent past projects, including timber harvesting, wildfires, watershed improvements, and other activities. Short-term analysis is considered at one to five years post-fire; long-term analysis extends out to greater than 20 years to model the potential effects of standing snags, downed wood, and subsequent surface fuel loading over time." The projected fuel loading within treatment units for the proposed action for the next 50 years is discussed on pages 156 to 157 of the FEIS in Figure 3FF.16.

As described on FEIS page 107: "Salvage logging and planting trees in moderate and high fire severity fire areas would generate some surface fuel, but the important factors in future fire behavior would be the naturally sprouting vegetation, the planted trees, and the wildfire-reduced volume of fine dead surface fuels. Reestablishment of a mixed conifer forest through planting would result in a wildfire risk (principally to the planted trees) in or immediately adjacent to these plantations. The potential for higher fire severity increases approximately five years after planting. Without plantation management, predicted fire severity increases until the trees overtop competing shrubs and begin to self-prune."

Using fire as a management tool in both the planned (prescribed fire) and unplanned setting may not meet desired resource objectives due to future fuel loading potential (with no salvage) as well as the hazard, cost and time needed to remove decaying hazard trees from planned control lines. This will be a limiting factor in future prescribed fire activities. Fuel treatments identified along strategic ridge and road systems will enhance future fire management activities including fire suppression, managing unplanned ignitions, and implementation of prescribed fire. Maintaining these treatments provides opportunities for fire managers to focus resources on priority locations. These treatments also provides opportunities to utilize confine and contain strategies on future fires where untreated areas still contain high densities of snags and inhibit safe work areas for fire suppression resources.

Fuel loadings were modeled to 50 years to demonstrate the potential for extreme fuel loadings over time and the removal of these fuel loadings. Long-term analysis extends out to greater than 20 years to model the potential effects of standing snags, downed wood and subsequent surface fuel loading over time.

Fuels treatments in the Sierra Nevada are intended to have a 10-15 year lifespan. Retreatment and maintenance can extend the effectiveness of these treatments, but without maintenance, these treatments are not expected to remain effective past that timeframe. Extreme fuel loading at 50 year in the modeling demonstrates the need for the removal of snags.

178. Comment (Commenter 21): As we suggested in our scoping comments and as suggested by North et al. (2015), mechanical treatments, in this case, salvage logging, would be most effective if used to establish "anchors" from which prescribed and managed fire could be strategically expanded. Such an idea seems to have been lost from purpose of the SFMZs, for instance, the fire and fuels analysis (page 3-109) offhandedly states, "treated areas under Alternative 3 are not large, nor strategically oriented enough to complement each other or provide sufficient benefit in terms of modifying fire behavior across the larger landscape or greatly enhancing fire suppression actions," and the analysis does not go on to consider the usefulness of the SFMZ as anchor points to increase the pace and scale of prescribed fire across the landscape to treat fuel accumulation and modify fire behavior. If you had included prescribed fire as a method to treat fuels within 10 years, as we suggested in our scoping comments, the fuels and the fire behavior analyses and your conclusions on the effectiveness of the alternatives and the SFMZs may have been considerably different.

Response: Purpose and need element 2 describes the need for the project to: "Strategically located fire management areas facilitate the effective suppression and control of unwanted future fires and provide control lines for the application of future prescribed fires in the project area"(FEIS, pg. 4). SMFZ were designed not only for fire suppression, but for large landscape scale prescribed fire units. The "Fire Management Strategy within the King Fire" (FEIS Appendix C) provided a landscape strategy for planned and unplanned ignitions in the King Fire. By combining mechanical work with fall and spring burning, it is possible to treat more areas in less time, while successfully achieving multiple resource management objectives.

179. Comment (Commenter 21): We also found that the methods you used to develop your fire behavior models were inherently biased. It is odd that you chose to model fuel accumulations 50 years into the future without the effects of vegetative regrowth or any management activities to reduce fuels, but you did not choose to model fire behavior with vegetation regrowth more than 10 years into the future. It is widely known that industrial forest plantations represent significant fire hazards well into the future, as was demonstrated when the King Fire and Rim Fires burned

through many thousands of acres of Forest Service and Sierra Pacific Industries plantations at high severity. According to Sapsis and Brandow (1997), nearly 120,000 hectares of forest plantations in California have never been treated since their initial site preparation and planting of seedlings and these neglected plantations currently have high fire hazards (Stephens and Moghaddas 2005). These papers demonstrate that fire hazard associated with plantations goes well beyond the time at which plantations begin to self-prune and over top shrubs.

Your fire behavior modeling results that project 4-foot flame lengths in all treated and planted areas under Alternative 2 and 4 are at odds with the notion in the DEIS (page 3-105) that in plantations, "the potential for higher fire severity increases approximately five years after planting. Without plantation management, predicted fire severity increases until the trees overtop competing shrubs and begin to self-prune." As we cited in our scoping comments, work by Stephens and Moghaddas (2005) found that in both pre-commercially thinned and un-thinned plantations between 15 and 19 years of age, overall tree mortality from wildfire was well above 80 percent under all modeled fire weather conditions, including 90th percentile weather conditions.

It is suspiciously convenient that your fire behavior modeling stopped at year 10, the point when intensive herbicide treatments would no longer be applied to kill brush and shrubs in plantations and fire behavior would drastically change. Such an analysis does not allow for an accurate comparison of the effects of the proposed alternatives on fire and fuels into the future. We ask that you model fire behavior out 50 years with vegetative growth for all alternatives to disclose the longevity of the treatments in altering fire behavior, compared to the no action alternative and to each other. Such an analysis, which considers fire-landscape realignment and mimicking the science-based fire frequency, would substantially contribute to the understanding of the impacts and potentially affect the agency's decision.

Response: The Forest agrees that there is a risk of mortality for plantations, especially unmaintained plantations from fire. The study by Stephens and Moghaddas (2005) have found "…modifying plantation tree density alone will not reduce the probability of mortality if surface fuel loads remain high enough to kill trees through scorching of live foliage independent of crown fire". Therefore surface fuel treatment, along with low density cluster planting designs and release treatments are proposed to reduce the expected flame lengths and fire intensities in these stands.

Vegetation treatments proposed would minimize the time that plantation trees are in a hazardous condition, however as release treatments proposed in this project are designed to be effective for at least 10 years, it is expected that after that time additional treatments, such as prescribed fire would be implemented to maintain the development of these stands. At this time however intermediate treatments are not proposed, and therefore are not analyzed in the document.

Invasive Species

180. Comment (Commenter 21): As we said in our scoping letter, page 14, herbicides are known to increase the prevalence of flammable grasses (Rinella et al 2009, McGinnis et al 2010). McGinnis et al. 2010 found that herbicide-treated areas have more alien grass and forb species than areas with high shrub cover" (McGinnis et al 2010), and the presence of dense flammable alien grass puts young conifers at risk from fire (Weatherspoon and Skinner 1995), and demands fire suppression to protect them. Countering this effect with additional herbicide usage to reduce the grasses leads to a scorched earth landscape supporting nothing but conifer crops, essentially

useless for wildlife, and exactly the model practiced by Sierra Pacific Industries. The EIS must address this issue using the available evidence and science we have provided.

Response: Direction in the Forest Service Manual section 2900, Noxious Weed Management (2012), includes a policy statement calling for a risk assessment for noxious weeds to be completed for every project. Furthermore, standards and guidelines for managing invasive plant species under the Sierra Nevada Forest Plan Amendment (USDA FS, 2004) include but are not limited to:

1. As part of project planning, conduct a noxious weed risk assessment to determine risks for weed spread (high, moderate, or low) associated with different types of proposed management activities. Refer to weed prevention practices in the Regional Noxious Weed Management Strategy to develop mitigation measures for high and moderate risk activities.
2. When recommended in project-level noxious weed risk assessments, consider requiring off-road equipment and vehicles (both Forest Service and contracted) used for project implementation to be weed free.
3. Minimize weed spread by incorporating weed prevention and control measures into ongoing management or maintenance activities that involve ground disturbance or the possibility of spreading weeds.
4. Conduct follow-up inspections of ground disturbing activities to ensure adherence to the Regional Noxious Weed Management Strategy.
5. As outlined in the Regional Noxious Weed Management Strategy, when new, small weed infestations are detected, emphasize eradication of these infestations while providing for the safety of field personnel.

This project's weed risk assessment (in the project file) addresses the increased risk of project activities resulting in the spread of weeds which are often more highly flammable than native plants. Design criteria in Chapter 2 of the EIS were incorporated to lower the risk of invasion from management activities.

The FEIS further analyzes the increase of both native and non-native grasses and forbs after the application of herbicides as proposed in the project:

> "*Over the short to long term, there will be an increased risk of invasive plant establishment and spread in this entire footprint resulting from the reduction in competing native vegetation cover and increased opportunity for introduction during the multiple entries for salvage, planting, and release activities….. Radius-only release treatments are proposed in areas of known or newly discovered high-risk invasive plant infestations in order to maintain competing native vegetation and reduce the likelihood that the infestation will spread outside the current extent. However, there is still a risk that invasive species, especially annual grasses, could establish within the released areas*" (FEIS pg. 79)

The goal of herbicide treatment is to reduce, not eliminate native shrubs.

> "*Over the short term, plant abundance may be affected by herbicide treatments, but no plant species would be expected to be eliminated from release treatments. Sites with reduced shrubs may have increased plant diversity and species richness compared to stands that are left untreated or only radially released. Battles et al. (2001) found that at the Blodgett Research Station in Georgetown, California, understory species richness was significantly greater in managed plantations than in less intensive treatment types. In mixed forests in Canada, Sutton (1993) found no detectable effect on species composition 10 years after herbicide treatments. DiTomaso et al. (1997) in northern California found no long-term detrimental effect on vegetative cover or species evenness with herbicide use. They also found*

that, in areas without herbicide treatment, biodiversity and, to a lesser extent, species evenness had not recovered after 14 years, in contrast with herbicide treated areas. Mcginnis et al. (2010) included both the Cleveland and Star Fires on the Eldorado National Forest in their study plots and found that grass and forb cover increased in plots that had been treated with herbicide, but where alien plants were present, their cover was significantly increased over areas where herbicide was not applied." (FEIS, pgs. 208 to 209)

Although the Forest Service acknowledges and analyzes the increase in risk of non-native invasives there are some problems with applying the findings in Rinella et al (2009) to the proposed project activities as the herbicide used in the study is a long lasting pre-emergent used to target broad leaf plants and because it has no effect on grasses, it is not surprising that increases in grass was seen after picloram was applied. As stated in Rinnella et al (2009):

"*The herbicide used was picloram, a growth regulator that injures or kills a wide range of forbs and other dicotyledonous plants while usually having little or no effect on grasses or other monocotyledonous species. Unlike herbicides that damage plants only following foliar contact (e.g., glyphosate), picloram can also damage plants following uptake from soil. Picloram can also curtail seed germination*"

Weatherspoon and Skinner 1995 found that that post-fire damage in plantations with grasses as understory was higher than in plantations with forbs as understory. There is not a proposal in this project to target forbs between released seedlings, as the presence of forbs are shown to reduce shrub competition with seedlings (MacDonald and Fiddler, 2010).

As described on page 157 of the FEIS "*Reforestation efforts will have better chances of survival due to anticipated surface fuel load reductions within planted area…. Despite an initial increased risk, primarily to planted seedlings from mortality. Until tree age and canopy base heights increase, younger conifer and hardwood stands will be susceptible to reburn and subsequent mortality" Overtime, invasive grasses would be reduced in cover, either from conifer shade or brush competition, or both with larger height from crowns to flammable fuels compared with shrub understories.*

Experience with wildfire in previously treated plantations with grass understories during the 2013 Kyburz fire showed that while reforestation treatments of the 2004 Fred's Fire areas still resulted in mortality to planted seedlings, fuel conditions benefited fire suppression tactics and improved firefighter safety. The grass understory in the area allowed for a more direct attack and allowed for a successful stop of the fire along a midslope road half-way up the canyon.

"The Kyburz Fire (Eldorado National Forest, 2013) provides an example of suppression success within a previously salvaged area. This fire started at the bottom of a slope within the South Fork American River. Diurnal winds fanned the fire up-drainage toward the community of Kyburz, (approximately one mile from the fire origin) and reburned areas within the footprint of the Freds Fire (2004). Treatments within the Freds Fire areas included post-fire logging activities to help reduce future fuel loading and snag density. The lack of heavy dead and down fuels allowed fire suppression resources to continue to construct direct control lines, keeping a safety zone around them within the "black." Salvage harvest activities in the previous Freds Fire area allowed for: a lower intensity Kyburz fire, less exposure to hazard trees, and less exposure during mop-up activities (Johnson 2013). If direct fire suppression tactics were not available, as a result of post-Freds Fire treatment and snag reductions, indirect line would have been required during nighttime operations, which would have only allowed for indirect fire suppression tactics and an increase in fire size (Jacobson 2013). Resources, including aircraft, heavy equipment, and personnel were safely able to drop water and retardant in open areas and construct line with minimal large woody debris. These tactics increased line production rates, and decreased resistance to control, allowing for resources to effectively work through the night to complete control lines and

keep the fire from entering the community of Kyburz (Ebert, Personal Observation: Burn Boss-Hey Joe Prescribed Burn; Division Supervisor-King Fire, 2014)" (FEIS, pg. 159)

Herbicides

181. Comment (Commenter 21): The use of herbicides in Alternatives 2, 4, and 5 compromises the ecological integrity of the recovering landscape.

Response: The Responsible Official will consider your input.

Approximately 40 percent of the acres of conifer forest type on National Forest System lands that burned with greater than 90 percent basal area mortality within the project area are in treatment units that would have reforestation and release activities with Alternatives 2 and 5 and approximately 51 percent would have reforestation and release treatments with Alternative 4 . In addition to the large areas of the landscape not being treated with any of these alternatives, a mixture of retention of snags and early seral habitat is provided through these alternatives. Swanson et al. 2011 suggests that "*maintenance of areas of naturally developing early successional forest ecosystems as part of a diverse landscape… should be 'in reasonable proportion to historical occurrences of different successional stages' as based on region-specific historical ecology*". Early seral post-fire habitats are just one component of a complex temporal landscape. Recent research has documented the importance of within and between stand heterogeneity that represents all seral stages and maximizes the presence of numerous species (White et al. 2013). Late successional habitats dominated by conifer trees are also an important successional stage. This seral stage evolved with low to moderate intensity fire and has a limited capacity to recover after stand replacing events due to limited natural regeneration and extensive shrub cover (Collins and Roller 2013). As a result, once conifer forests may be converting to new vegetation assemblages following high severity fire (Perry et al. 2011). As described in the analysis in Chapter 3 of the DEIS on pages 3-156 to 3-159, the use of herbicide decreases the time to develop key structures such as large trees within forest stands.

Furthermore, as described in the FEIS further analyzes the increase of both native and non-native grass and forbs with the use of herbicides as proposed in the project.

"*Over the short term, plant abundance may be affected by herbicide treatments, but no plant species would be expected to be eliminated from release treatments. Sites with reduced shrubs may have increased plant diversity and species richness compared to stands that are left untreated or only radially released. Battles et al. (2001) found that at the Blodgett Research Station in Georgetown, California, understory species richness was significantly greater in managed plantations than in less intensive treatment types. In mixed forests in Canada, Sutton (1993) found no detectable effect on species composition 10 years after herbicide treatments. DiTomaso et al. (1997) in northern California found no long-term detrimental effect on vegetative cover or species evenness with herbicide use. They also found that, in areas without herbicide treatment, biodiversity and, to a lesser extent, species evenness had not recovered after 14 years, in contrast with herbicide treated areas*." (FEIS, pgs. 208-209)

182. Comment (Commenter 21): Analysis of the Effects of Herbicides is Inadequate.

We are concerned that most of the references that we provided to you during scoping were not addressed in the DEIS. As such we find ourselves repeating some of the same information below. NEPA requires "accurate scientific analysis" (40 CFR §1500.1(b) and "environmental impact statements shall serve as the means of assessing the environmental impact of proposed agency

actions, rather than justifying decisions already made" (40 CFR §1502.2 (g)) and shall include a "summary of existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment" (40 CFR §1502.22)).

The DEIS acknowledges that it lacks information about the role of glyphosate formulations in causing endocrine disruption effects, although we provided you with several science papers relative to this issue. The DEIS states: "EPA is currently requiring additional tests on glyphosate to assess the potential of glyphosate to cause endocrine effects. Depending on the results of these tests, exposure to other agents which affect endocrine function could be associated with cumulative effects (SERA 2011)" (p. 3-116, DEIS). Please clarify what this sentence means. What other agents? We assume that the "other agents" refers to the additives or adjuvants, specifically the surfactants that are always added to glyphosate formulations, but the EIS needs to clarify this. Moreover, there are abundant references in the scientific literature attesting to endocrine disruption, and the reproductive toxicity of glyphosate formulations affecting wildlife species as well as human cells. Analysis must be included to assess the safety of the chemical products that will be used in the project area in regards to endocrine disruption, as well as other typical toxicological endpoints (reproductive toxicity, immunotoxicity and neurotoxicity). Failure to adequately disclose the potential environmental impacts from the project is not in compliance with NEPA. In 2001, a federal judge ruled against the Tahoe National Forest in approving the Cottonwood Project due to the failure of the agency to assess the full range of environmental impacts from the use of chemical herbicides (Cottonwood Fire Vegetation Management Environmental Assessment) (Californians for Alternatives to Toxics et al. v. Dombeck, No. Civ. S-00-2016).

Endocrine disruption is of particular concern, not only for humans involved in the applications, but to wildlife that will be exposed to the chemicals. Endocrine disruption can occur from minimal exposures, of the type that is most likely to occur in forestry applications, as when glyphosate formulations run off into standing water and streams, or pollinators or other organisms are sprayed during application. These are called "environmentally relevant" exposures, as they are likely to occur in the environment at low doses, and endocrine disrupting chemicals have significant effects at even infinitesimally small concentrations of exposure (in the realm of .001 ppb), in the same way that hormones have significant effects on living organisms at tiny amounts in the body. That is why they are called "hormone mimics," "endocrine mimics," or "endocrine disruptors." Formulations of glyphosate with surfactant adjuvants have been identified by scientists as causing endocrine disruption, and the Forest Service need not wait for the EPA to conduct its own analysis.

The key issue with glyphosate is that the environmental effects must be relevant to the products as they are actually applied in the field, as mixtures. There are numerous toxicological issues relative to glyphosate, as research scientists have now focused on studying how glyphosate products behave in real life usage, in other words, as mixtures with surfactants and other adjuvants. The analysis must relate to the impacts of the herbicide products as they will actually be used.

The surfactants that are proposed to be used with glyphosate, "Hasten or equivalent or SylTAC or equivalent," may behave similarly to the surfactant found in Roundup, POEA. The direct glyphosate action is most probably amplified by vesicles formed by adjuvants or detergent-like substances that allow cell penetration, stability, and probably change its bioavailability and thus metabolism" (Gasnier et al 2009, emphasis added). The role of surfactants is to allow glyphosate to permeate through animal cell membranes and has been demonstrated in numerous scientific studies (see Benachour and Seralini 2009, also see summary in Gasnier et al 2009). Benachour

and Seralini (2009) also used highly diluted, environmentally relevant dilutions to test the effects of glyphosate products on human cell lines, finding cell death and DNA fragmentation from all formulations tested, but the damage was worse in the formulations with surfactants added.

Glyphosate products were implicated as endocrine disrupting chemicals (Richard et al.2005) and found to interfere with transcription during cell mitosis (Marc et al. 2002, 2005). A summary of problems associated with false claims about the safety of Roundup—and not just glyphosate—were compiled by the New York State Consumer Fraud division of the Attorney General's office. Monsanto was fined $50,000 and found guilty of false advertising in New York in 1996. Monsanto was also fined in France, in 2007, for false advertising of the product Roundup. In March 2015, glyphosate was declared a "probable carcinogen" by the World Health Organization (IARC 2015, Guyton et al 2015).

To summarize the essential analytic information that is lacking in the materials used to determine the effects of the project:

- Analysis of the environmental impacts of the chemicals as they are actually applied in the field, as a formulation or mixture
- Disclosure of the environmental impacts of the degradates and secondary metabolites of the chemicals
- Disclosure of endocrine disruption effects at environmentally relevant (dilute) exposures

Cumulative effects analysis of the ecological effects to ecosystems from use of herbicides to manipulate vegetation, at the landscape level taking into consideration the impacts on private lands.

Response: Development of a pesticide risk assessment is part of this planning process. The project specific risk assessment (available in the project record) includes an analysis of risk for glyphosate use with proposed additives. Additionally, a discussion of secondary metabolites has been added to the Final EIS.

The toxicity data on technical grade glyphosate are extensive, including both a standard set of toxicity studies submitted to the U.S. EPA/OPP in support of the registration of glyphosate as well as a robust open literature consisting of numerous and diverse *in vivo* and *in vitro* studies. The 2011 SERA risk assessment (and the project risk assessment) discloses and reviews the current body of literature regarding endocrine disruption and glyphosate including references provided by the commenter during scoping (Marc et al. 2002, 2005; Richard et al. 2005; Gasnier et al. 2009; Benachour and Seralini 2009).

"*Several studies conducted outside of the United States on glyphosate formulations which are not used domestically report adverse effects of concern, including potential effects on endocrine function in rats and signs of genotoxicity in humans. In the absence of comparable studies on glyphosate formulations manufactured and used in the United States, the extent to which this information is relevant to U.S. formulations of glyphosate is unclear*" (SERA, 2011; p.20).

"A *summary of the available in vitro studies relevant to the assessment of glyphosate or glyphosate formulations on endocrine function is given in Appendix 2, Table 7. Several early in vitro assays suggest that glyphosate as well as Roundup have a low or equivocal potential for endocrine disruption (Lin and Garry, 2000; Petit et al., 1997; Walsh et al., 2000), but some more recent studies raise concern that glyphosate and some glyphosate formulations may be able to impact endocrine function through the inhibition of hormone synthesis*

(Richard et al. 2005; Benachour et al.2007a,b), binding to hormone receptors (Gasnier et al. 2009), or the alteration of gene expression (Hokanson et al. 2007)." (SERA, 2011; p. 48).

"*For example, as discussed in further detail in Section 3.1.9.1.2, one study on a Brazilian formulation of Roundup (Dallegrave et al. 2007) indicates that a dose of 450 mg a.e./kg bw of this formulation results in a decrease in testosterone in male rats. While this effect cannot be unequivocally associated with the surfactant, the available in vitro studies on endocrine function suggest that the surfactant is the component in the formulation which most likely to impact endocrine function (Section 3.1.8). The sensible question in terms of the Forest Service risk assessment, which focuses on formulations manufactured in the United States, is whether the results from the Brazilian study are relevant to U.S. formulations*."(SERA, 2011; p. 81).

"*The U.S. EPA has initiated registration review of glyphosate. In addition and as noted in Section 3.1.8, the EPA is requiring additional testing of glyphosate for effects on the endocrine system. It seems very likely that the EPA will review the Dallegrave et al. (2007) and Romano et al. (2010) studies and any additional data on glyphosate which become available. Thus, the status of U.S. EPA review of glyphosate should be monitored with some care over the next several years.*" (SERA, 2011; p.110).

The 2011 SERA risk assessment and the FEIS acknowledge that the EPA was requiring additional tests on glyphosate to assess the potential of glyphosate to cause endocrine effects at the time of that analysis (FEIS, pg. 168). The EPA has now completed tier 1 testing and as a result: "*Based on weight of evidence considerations, mammalian or wildlife EDSP Tier 2 testing is not recommended for glyphosate since there was no convincing evidence of potential interaction with the estrogen, androgen or thyroid pathways*" (US EPA, 2015: p. 2).

Analysis on typical toxicological endpoints (reproductive toxicity, immunotoxicity and neurotoxicity) requested in the comments were explicitly addressed in detail in the 2011 SERA risk assessment. There seems to be little to no discussion of indications of immunotoxicity with glyphosate. In regards to reproductive toxicity the SERA Risk Assessment states:

"As is the case with most Forest Service pesticide risk assessments, the data used to assess the risk to mammalian wildlife as well as human exposure to glyphosate and glyphosate formulations is largely the same. Thus, Section 4.1.2.1 focuses primarily on studies useful for assessing differences in pesticide sensitivity among various species of mammalian wildlife. The dose response assessment for mammalian wildlife (Section 4.3.2.1) presents a fuller discussion of concerns for reproductive toxicity raised by the recent Dallegrave et al. (2007) study conducted with a South American formulation of Roundup. In some respects, however, it is some early, detailed field studies on mammalian wildlife which have a substantial impact on the hazard identification for human health and mammalian wildlife. These early studies do not report adverse reproductive effects in populations of small mammals following applications of U.S. formulations of Roundup (Ritchie et al. 1987; Sullivan 1990)" (p.114).

In regards to neurotoxicity, the SERA Risk Assessment describes that:

"In severely poisoned animals, virtually any chemical may cause gross signs of toxicity which can be attributed to neurotoxicity—e.g., incoordination or convulsions. A direct neurotoxicant, however, is defined as a chemical that interferes with the function of nerves, either by interacting with nerves directly or by interacting with supporting cells in the

*nervous system. This definition of a direct neurotoxicant distinguishes agents that act directly on the nervous system (direct neurotoxicants) from those agents that might produce neurological effects secondary to other forms of toxicity (indirect neurotoxicants). U.S. EPA has developed a battery of assays to test for neurotoxicity (U.S. EPA/OCSPP 2010), and U.S. EPA/OPP requires neurotoxicity studies for pesticides when standard toxicity studies or other considerations such as chemical structure suggest that concerns for effects on the nervous system are credible……*In *the Reregistration Eligibility Decision (RED) document for glyphosate (U.S. EPA/OPP 1993a), the U.S. EPA notes that standard toxicity studies of glyphosate do not suggest that this pesticide is neurotoxic and that specific toxicity tests for neurotoxicity are not necessary:*

The acute and 90-day neurotoxicity screening battery in the rat (guidelines 81-8-SS, 82-7) is not being required since there was no evidence of neurotoxicity seen in any of the existing studies at very high doses and this chemical lacks a leaving group; therefore, it would not seem likely to inhibit esterases (the presumptive neurotoxic mechanism of concern for all organophosphates). U.S. EPA/OPP 1993a, p. 18

As noted above, the reference to a leaving group in the above quotation refers to the lack of structural element on the phosphorus atom in glyphosate which would be indicative of a neurotoxic agents, such as a halide, sulfur, or thiocyanate group.

Subsequent to the RED, standard neurotoxicity studies on glyphosate were conducted, including an acute and subchronic neurotoxicity studies in rats (Horner 1996a,b) and a delayed neurotoxicity study in hens (Johnson 1997)" (SERA, pp. 40-41).

Multiple existing studies on the toxicology of glyphosate are further described in the SERA Risk Assessment.

The USFS human health and ecological risk assessment for glyphosate (SERA 2011), includes a lengthy discussion of the mutagenic and carcinogenic potential of glyphosate including non-Hodgkin's lymphoma (Section 3.1.10).

Recently, the International Agency for Research on Cancer (IARC) Monograph Working Group determined that glyphosate should be classified as "probably carcinogenic to humans" (Guyton et al 2015). This recent decision was based on a review of existing studies and not on new research. The issue is a particular group of cancers called non-Hodgkin's lymphomas. The Guyton 2015 paper is only a summary of a longer paper that is in-press at this time.

In 1991, US EPA concluded that glyphosate should be classified as a Group E (evidence of non-carcinogenicity for humans) based on a lack of convincing carcinogenicity evidence and considering the criteria in EPA Guidelines for classifying a carcinogen. In a few months, US EPA will be releasing for public comment their preliminary human health risk assessment for glyphosate as part of their program to reevaluate all pesticides periodically (link to US EPA's glyphosate reevaluation docket - http://www.regulations.gov/#!docketDetail;D=EPA-HQ-OPP-2009-0361).

The USFS human health and ecological risk assessment for glyphosate (USFS 2011), includes a lengthy discussion of the mutagenic and carcinogenic potential of glyphosate including non-Hodgkin's lymphoma (Section 3.1.10). Many of the key references used in Guyton (2015) and

another recent, but more in-depth review (Schinasi and Leon, 2014) are discussed in the glyphosate risk assessment. The USFS risk assessment concludes (page 70):

The nature of the available epidemiology data on glyphosate is addressed in the U.S. EPA/OPP (2002) assessment:

> *This type of epidemiologic evaluation does not establish a definitive link to cancer. Furthermore, this information has limitations because it is based solely on unverified recollection of exposure to glyphosate-based herbicides.*

Based on an evaluation of the available animal studies as well as epidemiology studies, U.S. EPA/OPP (2002, p. 60943) classifies the carcinogenic potential of glyphosate as Group E, No Evidence of Carcinogenicity. Given the marginal mutagenic activity of glyphosate (Section 3.1.10.1), the failure of several chronic feeding studies to demonstrate a dose-response relationship for carcinogenicity, and the limitations in the available epidemiology studies on glyphosate, the Group E classification in U.S. EPA/OPP (1993a, 2002) appears to be reasonable.

It has been USFS practice to defer to US EPA unless there is a compelling reason to do otherwise. At this point, there is not yet a compelling reason to adopt the IARC's classification since all the technical details are not yet available from IARC and since US EPA's and our analyses would indicate a different conclusion. As stated, a new risk assessment from US EPA is expected later this year which will undoubtedly consider the IARC's classification. If the US EPA accepts the IARC recommendation, then the USFS would consider an update to the glyphosate RA and for purposes of existing NEPA documents, such a reclassification would be considered 'new information'.

Guyton, Kathryn Z., et al. 2015. Carcinogenicity of tetrachlorvinphos, parathion, malathion, diazinon, and glyphosate. Lancet Oncology. Published online March 20, 2015. http://www.thelancet.com/pdfs/journals/lanonc/PIIS1470-2045%2815%2970134-8.pdf. Accessed online on 4/15/15.

Schinasi, Leah and Maria E. Leon. 2014. Non-Hodgkin lymphoma and occupational exposure to agricultural pesticide chemical groups and active ingredients: a systematic review and meta-analysis. International Journal Environmental Research and Public Health. 2014 (11) 4449-4527.

US Environmental Protection Agency (EPA). 2015. EDSP: Weight Of Evidence Analysis Of Potential Interaction With The Estrogen, Androgen Or Thyroid Pathways. Office Of Pesticide Programs, Office Of Science Coordination And Policy, U.S. Environmental Protection Agency

183. Comment (Commenter 21): In 2004 and 2005, research published from University of Pennsylvania documents the severe effects from glyphosate products containing the surfactant POEA (in Monsanto's Roundup) upon frog tadpoles at exposure concentrations considered "environmentally relevant," dilute concentrations easily encountered by the organism in the field where runoff may occur (Relyea 2005a, b, c). Further, Relyea found that different species react

differently to the same chemical exposures. For example, Roundup exposure at realistic concentrations killed all leopard and gray tree frog tadpoles and 98 percent of wood frog tadpoles. The DEIS failed to consider that some amphibians (for example, Western toad) undergo metamorphosis in ephemeral pools that may occur inside clearcut units, so the issue is not limited only to aquatic applications. It is apparently not possible for the Forest Service to get a list of the ingredients in these products, making it convenient to ignore possible toxic environmental effects. Lack of information about the composition of the materials proposed for use should be a good enough reason to reject the use of such products on public lands.

Response: Studies from Relyea were included in the 2011 SERA risk assessment on Glyphosate. Hazard Quotients for glyphosate were developed as part of the 2011 SERA Risk Assessment. These hazard quotients can be found in the applicable project analysis. The more toxic formulations of glyphosate involve the formulations which contain the polyoxyethyleneamine (POEA) surfactant, which will not be used in the project. The toxicity of the original Roundup and similar formulations containing POEA surfactants is greater than the toxicity of technical grade glyphosate, Rodeo, or other formulations that do not contain surfactants. For the more toxic formulations of glyphosate (i.e., formulations with POEA), the risk characterization for aquatic organisms suggests that amphibians are the group at greatest risk in both terms of sensitivity and severity of effects. Products proposed for use do not have a surfactant as part of the glyphosate product, however as described in Chapter 2 of the FEIS, proposed additives include Hasten, Syl-Tac, and Competitor (aquatic formulation) as surfactants.

The study by Relyea simulated a direct overspray of a small wetland which is an illegal use of such a formulation. Relyea used the commercial form of Roundup containing the POEA surfactant. Thus, inferences from Relyea's results should only apply to formulations that contain this common surfactant and not to other forms of glyphosate. Glyphosate formulations such as Rodeo and Accord do not contain a surfactant (they contain only glyphosate and water), but the consumer must purchase a separate surfactant and combine it with the product to make it effective. Analysis of surfactants and additives proposed with this project is included in the Risk Assessment for the project.

Monitoring results, based on over 150 surface water samples taken at locations in National Forests in California between 1991 and 2002, indicate that glyphosate applied by ground application seldom reached surface water even with "no spray" buffer widths as narrow as 10 feet (Bakke 2001). The highest concentration of glyphosate measured by the US Forest Service in Region 5 since 1991 was less than 30 micrograms per liter (ug/L). In addition, approximately 99 percent of the stream samples tested had concentrations less than the laboratory detection limit. The Minimum Detection Limit for glyphosate is 1 to 25 ug/L. Additionally, herbicide monitoring for glyphosate in surface water performed on the Eldorado National Forest between 1993 and 2007, showed no detection of glyphosate in any of 29 samples (Markman 2008).

Short term peak water contamination rates based on no stream buffers, are 0.1 mg a.i./L at the proposed application rate while long-term peak application rates are much lower. Water contamination rates would be expected to be much higher in the event of a spill, however design criteria have been developed to establish no spray buffers for set distances from waterways and to minimize the potential of an accidental spill occurring and entering a waterway. Based on the Aquatic Species analysis for the project proposed glyphosate application is expected to not significantly impact amphibian species analyzed.

A site specific risk assessment has been conducted for the project to determine and disclose potential adverse effects of herbicide application on forest resources. This analysis is available in the project record. While there is a potential for negative effects to amphibians from

herbicide application proposed in this project as shown by the hazard quotients displayed in table 3W-A3 on page 259 of the FEIS, stream buffers included in the design criteria are expected to minimize any exposure and therefore reduce the potential for any negative effects on amphibians. Species specific analysis for aquatic species effects from herbicide are documented in the FEIS as follows: CRLF page 264, SNYLF on page 268, and FYLF on page 272. Identification of ephemeral pools in proximity to treatment areas will be evaluated and surveyed to reduce the potential for impacts to aquatic biota. Operation during weather conditions that could increase risk to aquatic and hydrologic resources have be restricted.

184. Comment (Commenter 21): Amphibians are particularly vulnerable to exposure to toxins because of their ability to absorb chemicals through their thin skin. Effects to amphibians must be analyzed in terms of acute and chronic toxicity as well as endocrine disruption, immunotoxicity, neurotoxicity, and reproductive toxicity. Sources of exposure must be analyzed relative to drift and run-off, puddles/ephemeral pools etc. and the surfactants used with glyphosate products must be disclosed and discussed in the analysis of environmental impacts. Claims of the safety of Roundup's active ingredient, glyphosate, in aquatic environments is not supported by recent scientific studies. In one study, Perez et al (2007) concluded: "In contrast to the manufacturers' claims on the environmental safety of glyphosate, several studies have demonstrated that glyphosate alone or in combination with the additives used in commercial formulations may be damaging to aquatic biota."

Surfactants may be the principal toxic component in the formulated glyphosate products to aquatic organisms (Tsui and Chu, 2003). In a review of toxicological data, Giesy et al. (2000) found POEA to be more toxic to fish than glyphosate alone. However, glyphosate is never applied alone.

Response: The Syracuse Environmental Research Associates (SERA) prepared a human health and ecological risk assessment for glyphosate (Feb 2011) and utilized the information from Perez et al. (2007), Tsui and Chu (2003) and Giesy et al (2000) and many other studies to establish that the surfactants are often more toxic to aquatic organisms than the glyphosate active ingredient. This is a compilation of relevant science specific to glyphosate and its uses. Analysis includes hazard identification, assessment of exposure and an assessment of risk associated with the application of glyphosate.

Specific to this project, a comprehensive human health and ecological risk analysis was prepared using spreadsheets prepared by SERA (2014). This included both an acute and chronic effects assessment. Effects to aquatic species are discussed in Chapter 3 of the FEIS (pages 246 to 280). Scenarios that identified a greater risk where hazard quotients exceed one are recognized and project design features have been developed to reduce that risk, such as AR-9 on page 29 of the FEIS which identifies areas where herbicide use would be avoided. Effects of proposed additives to amphibians are further analyzed in the general effects to aquatic species analysis sections of Chapter 3 of the FEIS (pgs. 259 to 260).

As described in Chapter 2 of the FEIS, proposed additives include Hasten, Syl-Tac, and Competitor (aquatic formulation) as surfactants. The methylated seed oils are formed from common seed oils, such as canola, soybean, or cotton. They act to increase penetration of the herbicide in plants through the reduction of water surface tension. These are comparable in performance to crop oil concentrates. In addition, silicone-seed oil blends are also available that take advantage of the spreading ability of the silicones and the penetrating characteristics of the seed oils. The U.S. Food and Drug Administration (FDA) considers methyl and ethyl esters of fatty acids produced from edible fats and oils to be food grade additives (CFR 172.225).

Because of the lack of exact ingredient statements on these surfactants however, it is not always clear whether the oils that are used in them meet the U.S. FDA standard (Bakke 2002 updated 2007). As further analyzed in Bakke (2002 updated 2007) studies indicate that in general non-ionic surfactants have less of an effect on the skin, and hence absorption. In several studies, the addition of a surfactant actually decreased the absorption through the skin. Therefore, as described on page 260 of the FEIS in relation to impacts on aquatic species, "*surfactants such as MSOs are virtually nontoxic and are not likely to impact the toxicity of glyphosate and thus have no substantial impact on the risk characterization of glyphosate*".

185. Comment (Commenter 21): Recently, studies of human cell line responses to agriculturally relevant, diluted glyphosate based herbicides were found to "present DNA damages and CMR effects on human cells and in vivo.

Response: This quote is from a study by Gasnier et al. (2009) in which the authors looked at the possible carcinogenic, mutagenic, and reproductive effects of glyphosate and glyphosate formulations. This study is referenced in the SERA glyphosate risk assessment (SERA 2011). The toxicity data on technical grade glyphosate are extensive, including both a standard set of toxicity studies submitted to the U.S. EPA/OPP in support of the registration of glyphosate as well as a robust open literature consisting of numerous and diverse in vivo and in vitro studies. As with any complex collection of studies, the studies on technical grade glyphosate may be subject to differing interpretations. The preponderance of the available data, however, clearly indicates that the mammalian toxicity of glyphosate is low, and very few specific hazards can be identified (SERA, 2011, p. 19).

186. Comment (Commenter 21): The analysis must not be limited to toxicological effects analysis only. Conclusory remarks about effects to wildlife, rare plants, and people based on supposition without evidence are not acceptable ("Agencies…shall make explicit reference by footnote to the scientific and other sources **relied upon for conclusions in the statement**" NEPA 40 CFR § 1502.24). References and resources should be supported by citation and footnote.

Response: The Syracuse Environmental Research Associates (SERA) prepared a human health and ecological risk assessment for glyphosate (Feb 2011). This is a compilation of relevant science specific to glyphosate and its uses. Analysis includes hazard identification, assessment of exposure and an assessment of risk associated with the application of glyphosate. Specific to this project, a comprehensive health human and ecological risk analysis was prepared using spreadsheets prepared by SERA (2014). This analysis in addition to other literature is used in the applicable effects analysis sections in Chapter 3 of the FEIS. References used in analysis are cited in the specific analysis and included in the references section of the FEIS.

187. Comment (Commenter 21): Herbicide Use has not been shown to be Essential
The DEIS made no mention of the guiding document for reforestation and vegetation management in the region, the 1989 FEIS and ROD for Vegetation Management for Reforestation. Since no other comprehensive vegetation or herbicide management EIS has been approved through the NEPA process, this document is still the guiding direction for the agency.

The 1989 ROD selected Alternative 1 which explicitly states: "Herbicides are to be used only where essential to achieve the resource management objectives" (VMR ROD, p.9).

We believe that the controversy surrounding herbicide use, and the lack of updated pesticide literacy on the part of the Forest Service, demonstrates the need for a new Vegetation Management EIS region-wide to bring the agency up to speed with the most current and relevant science. We also believe that the lack of updated information about the toxicity of glyphosate, the risks to wildlife as well as applicators and others that may be exposed to the chemical, in combination with cumulative impacts from the uses on adjacent private timber lands, indicate that the agency must set aside the proposal to use herbicides.

Response: The 1989 FEIS for Vegetation Management for Reforestation (1989 FEIS) was written for a goal that is different from this project. The Record of Decision (ROD) for the 1989 FEIS states that it selects the Regional vegetation management policy for reforestation for commercial wood production in the Region. The purpose of the King Fire project is the restoration of a large landscape that was burned over in a wildfire, in line with the Regional Forester's Leadership Intent Statement for Ecological Restoration. The 1989 FEIS was designed to implement herbicide-use policies that were in place in 1981. Since that time the Region's policies on herbicide use have changed, to better reflect the use of Integrated Pest Management principles, and to utilize management practices that best meet management needs. The R5 FEIS contains some relevant information regarding reforestation treatments and is accordingly referenced in the DEIS. However, as the stated purpose and need of reforestation treatments under the King Fire Restoration Project is not commercial wood production other factors are considered in the determination of whether or not herbicides are required for the survival and development of reforested stands.

The analysis in Chapter 3 of the FEIS shows the use of herbicides as necessary to achieve the purpose and need element number 3 of actively managing the forest to achieve restoration and resilience. Proposed reforestation strategies provide a higher likelihood of achieving desired future structure and species composition with reduced cost and greater efficiency. As shown in the analysis in Chapter 3, without the use of herbicides, initial survival and growth would be much lower in many locations due to insufficient control of competing vegetation. Scientific literature referenced in Chapter 3 of the FEIS (pages 208 to 209) and reforestation of numerous fires on the Eldorado National Forest show that herbicide release provides for:

- Increased seedling survival and increased conifer species diversity with that increased survival,
- Decreased time needed to reach a height and structure where seedlings have an increased ability to withstand low intensity fire.

In terms of toxicity information on glyphosate, the Syracuse Environmental Research Associates (SERA) human health and ecological risk assessment for glyphosate in Feb 2011 incorporates and reviews relevant science on glyphosate, providing a comprehensive source of information on the potential human health and ecological impacts from the use of glyphosate in Forest Service management programs.

188. Comment (Commenter 21): We are concerned that the proposal does not adequately mitigate for impacts to pollinators, including the ENF sensitive species Western bumble bee. While acknowledging that "Herbicide use for enhancing reforestation can greatly reduce nectar supplies, which in turn limit bumble bee colony success," the DEIS suggests that impacts are short term.

However, the use of herbicides in Alternatives 2, 4, and 5 would effectively eliminate the shrub and non-conifer vegetation over the life of the unit (see post fire plantation image submitted in comments).

Response: Proposed herbicide use is expected to reduce, but not eliminate shrub cover within the treatment units, and to increase cover of herbs and forb. Areas treated by glyphosate are expected to have shrub levels of less than 30 percent for at least 10 years. Glyphosate is a contact herbicide that has no pre-emergent effect. Grasses, forbs, and shrubs would continue to persist in the units, and the species composition is expected to shift from one dominated by shrubs in many area to one dominated by forbs and grasses, with shrubs still present. This is because plant present in the area prior to herbicide application would develop from seed in the soil, neighboring treated areas, and through recovery of plants surviving initial treatments (FEIS, pages 208 to 209).

Analysis of the Western bumble bee is included in Chapter 3 of the FEIS. "The honey bee is the standard test organism for assessing the potential effects of pesticides on terrestrial invertebrates, and there is a standard set of glyphosate studies on this species (Palmer and Beavers 1997; Palmer and Krueger, 2001a; Palmer and Krueger, 2001b)" These studies indicate that effects are not likely to bees at 100 µg/bee (SERA, 2011) which is below the estimated exposure rates for the proposed herbicide applications.

Furthermore in regards to the proposed surfactants, as described in USDA (2002 updated 2007):

"*Based on a review of the current research, it would appear that surfactants have the potential to affect terrestrial insects. However, as is true with many toxicity issues, it would appear that any effect is dose related. The research does indicate that the silicone-based surfactants, because of their very effective spreading ability, may represent a risk of lethality through the physical effect of drowning, rather than through any toxicological effects. Silicone surfactants are typically used at relatively low rates and are not applied at high spray volumes because they are very effective surfactants. Hence it is unlikely that insects would be exposed to rates of application that could cause the effects noted in these studies. Other surfactants, which are less effective at reducing surface tension, can also cause the drowning effect. But as with the silicones, exposures have to be high, to the point of being unrealistically high, for such effects. When considering the need for relatively high doses for a lethal effect, combined with the fact that individuals, not colonies or nests of invertebrates, may be affected, there is little chance that the surfactants could cause widespread effects to terrestrial invertebrates under normal operating conditions. Spills or accidents could result in concentrations sufficiently high to cause effects, depending upon the surfactant*.

189. Comment (Commenter 21): The picture is typical of the plantations that burned in the King Fire. It is clear that there were no shrubs or hardwoods in the unit prior to the fire, as they were eliminated with herbicide spraying at an earlier time in exactly the same fashion as is now planned.

The understory in these stands provides little to nothing for wildlife. It is therefore not accurate to say that such practices are not significant or have only a short term effect on species composition and the wildlife which depend upon them for food, nesting, and other habitat elements. Release, whether by spray or by hand, eliminates the other forest plant species that comprise a healthy, vibrant, and productive forest.

Plantation in King Fire, Georgetown Ranger District

Response: Post fire pictures in which all of the ground cover and tree needles have been consumed by fire do not provide evidence that shrub cover was not present prior to burning.

There were several thousand acres of plantations within the King Fire that experienced extreme fire intensity. These burned-over plantations were variable at the time of the fire in terms of their understory composition, however none of these plantations consisted of conditions as stated in the comment, i.e. "It is clear that there were no shrubs or hardwoods in the unit prior to the fire, as they were eliminated with herbicide spraying at an earlier time".

While some of the plantations had been masticated and in some instances also treated with herbicides 1-3 years prior to the fire, it is not correct to suggest that the shrubs and other understory had been eliminated from any of the plantations. Shrubs were still present in these recently treated plantations; it was typically younger, smaller in stature and less dense than the shrubs that were present in plantations that were not treated with masticationor herbicides. However, the intensity of the King Fire erased much of the evidence of the presence of the shrubs. It may be important to note that much of the evidence of shrubs in previously untreated plantations or pure brushfields was also largely erased by the fire intensity with only a few brush skeletons, or short, burned stubs remaining, whereas before the fire there were in many, many cases, dense 25-50 year-old or older brushfields with stems 1-4 inches in diameter. For example, plantations along Nevada Point Ridge that did not have mastication with the Big Grizzly project prior to the fire also had complete consumption of understory vegetation, including shrubs that were present prior to the fire as can be noted in the picture below.

Photograph of Nevada Point Ridge untreated plantation burned in King Fire, with heavy shrub understory prior to the fire. Photo taken by Archeology crew on 10/14/2014

Shrubs and other understory vegetation have already begun to reestablish from resprouting and from seed in the plantations treated prior to the King Fire, including in plantations treated with herbicide prior to the fire. This stand was treated with herbicide the year prior to the fire (May 2013). This stand was planted under a CE Decision this year and is analyzed for release in the King Fire Restoration project. As seen in the photo, shrub cover is quickly becoming dominate and is therefore identified as crucial to treat in order to maintain seedling survival and stand development.

Photograph of Nevada Point Ridge Plantation Burned in King Fire that had been masticated and treated with herbicide in 2013 with the Big Grizzly Project at the intersection of 14N20 and 14N10. Photo taken by Dana Walsh, Silviculturist on 7/10/2015

Proposed herbicide use is expected to reduce, but not eliminate shrub cover within the treatment units, and to increase cover of herbs and forb. Areas treated by glyphosate are expected to have shrub levels of less than 30 percent for at least 10 years. Since glyphosate is a contact herbicide that has no pre-emergent effect, vegetation present prior to treatments would begin to re-establish following treatment. Plants would develop from seed in the soil, neighboring treated areas, and through recovery of plants surviving initial treatments. Over the short term, plant abundance may be affected by herbicide treatments, but no plant species would be expected to be eliminated from release treatments. Sites with reduced shrubs may have increased plant diversity and species richness compared to stands that are left untreated or only radially released (FEIS, pages 208 to 209).

Plantations treated with glyphosate on the Georgetown District have shown a continued cover of shrubs following effective herbicide treatment that reduce cover to between 10 and 30% as can be seen in the example below.

Photograph of 2001 Star Fire plantations at approximately 8 years old which were treated with herbicide as part of establishment showing a mixture of trees, shrubs and other understory vegetation. Photograph taken 8/31/2011 in Chipmunk Creek Vicinity (stand 328-146) . Photo taken by Dana Walsh, Silviculturist.

Effects of proposed treatments on wildlife use are analyzed in Chapter 3 of the FEIS.

NEPA and NFMA

190. Comment (Commenter 21): Failure to Provide a Biological Evaluation Violates NEPA's Hard Look Standard. According to FSM 2672.1, "Sensitive species of native plant and animal species must receive special management emphasis to ensure their viability and to preclude trends toward endangerment that would result in the need for Federal listing. There must be no impacts to sensitive species without an analysis of the significance of adverse effects on the populations, its habitat, and on the viability of the species as a whole." It has been our experience that the Forest Service provides an analysis and makes a determination on the likelihood of proposed projects resulting in a trend toward federal listing in a Biological Evaluation, released concurrently within draft NEPA documents. In this particular case the Forest Service has sought "alternative arrangements" stipulations from CEQ which further harms our ability to review and comment on potential impacts in the DEIS/BE due to collapsed timeframes. However, in this case, the DEIS and supplementary materials do not provide a written draft determination on the likelihood that any of the alternatives may result in a trend toward federal listing. Although such a determination is required under Forest Service regulations at, FSM 2672.4 and not NEPA, failure to disclose such a determination at this time violates NEPA's hard look standard because you have not disclosed to the public if the restoration activities proposed under any of the alternatives may lead to a loss of viability and increase the likelihood that listing under the federal Endangered Species Act is necessary. This unnecessary time crunch is due to the collapsed timeframes for NEPA review under the "alternative arrangements" agreement requested by the ENF from CEQ. The

timing for completion of spotted owl monitoring and full disclosure of site-specific impacts and impacts to the population as a whole are required by law, regulation and policy. An informed decision is critical and should not be rushed. 40 CFR§1500.1 states the fundamental purpose of NEPA which requires information be available before a decision is made and before actions are taken. Important criteria are that information be of high quality, be scientifically accurate, contain expert agency comments and undergo public scrutiny. Complying with NEPA and Forest Service Manual requirements is critically important for species populations trending towards extinction.

We believe that failure to provide a trend toward federal listing determination stemming from the current proposed action and alternatives is a violation of NEPA's hard look standard, requiring that you prepare a Supplemental DEIS.

Response: Analysis of impacts to California spotted owl were provided in Chapter 3 of the FEIS (pgs. 298 to 311), FEIS Appendix E, and summarized on FEIS page xxvi. Please refer also to response to Comment 124. The DEIS took a hard look at the potential effects of the Project on the owl by disclosing the impacts of the proposed action and alternatives. Environmental consequences included information on the effects of project actions at the stand, territory and landscape scale as well as effects by alternative. FEIS Appendix E described the evaluation of CSO PACs in the King Fire in compliance with the Forest Plan. The BE further expands on the hard look and includes information which was prepared consistent with policy direction. Implementation of the alternative modified by the Decision would not threaten the viability of owl populations or further a trend towards listing under the ESA (BE) given the mitigations through LOPs, snag retention, or no treatment areas. Project impacts were disclosed in the FEIS and supplementation is not required.

191. Comment (Commenter 21): the King Fire DEIS should disclose the positive fire effects of an enlightened fire-landscape realignment strategy. Some of these positive outcomes include: reduced fuel loads, increased nutrient recycling, biodiversity enhancement, seed scarification, snag and down log creation, opening creation, increased general stand to landscape level heterogeneity, and most importantly reduction of uncharacteristic, high severity fire effects (Silvas 2011).

Response: The Responsible Official will consider your input. The FEIS described positive fire effects and strides to maintain important structural values and process. For example:

- FEIS page 5 describes the retention of important attributes of post-fire habitat at the landscape scale and within treatment areas to support the diversity and abundance of species (including the importance of snags, naturally regeneration vegetation [e.g. shrubs]).
- FEIS page 144 (and 174) described reduced fire spread and intensity due to the reduction of available surface fuels from the fire.
- FEIS page 174 describes nutrient cycling benefits from fire.
- FEIS page 174 described heterogeneity that would be created from prescribed fire.
- FEIS page 303 describes post-fire environment benefits to CSO prey species and structure, such as snags and downed wood.
- FEIS page 304 describes the heterogeneous conditions created by low-and moderate-severity fire and how I may provide habitat suitable for CSO.

192. Comment (Commenter 21): In a general sense, using the words "variable", "clumping" or "GTR principles" for designing any forest management strategy absent explicit definition of what is being planned violates the intent of NEPA for scientific integrity and accuracy.

Response: Proposed reforestation design including tables depicting specific ranges of trees per acre to be planted given landscape positions and conditions are included in the description of the proposed action in Chapter 2 of the FEIS on pages 15 to 17 and contain supporting scientific basis for the proposal.

193. Comment (Commenter 21): Logging of burned forest now may "commit resources prejudicing selection of alternatives before making a final decision" (49 CFR § 1502.2 (f)) in any future decisions about planting, since salvage logging is known to interfere with natural regeneration (Donato et al 2006, Lindenmayer et al 2008, Peterson et al 2009). If clearcutting is used this would predispose the agency towards future tree planting.

Response: The statement the commenter is referring to is 40 CFR 1502.2 (f) which speaks to the EIS action and not separate, future actions. 40 CFR 1502.2 (f) also references §1506.1 which addresses limitations on actions during NEPA process**.** As described in of the FEIS:

"Although post-fire seedling establishment is driven by a series of factors (e.g., available moisture, soil insolation, rodent herbivory, damping-off fungi), the foremost requirement for most natural conifer regeneration is a seed source (Bonnet et al. 2005)" (FEIS Appendix B, page 15.)

"*The ability of forests to regenerate after stand replacing fire is highly dependent on seed sources. Larger patches can create openings larger than available seed from neighboring surviving conifers can reach (Bonnet 2005). Areas that have experienced high-severity fire have been shown to have dramatically lower regeneration rates for conifers and especially for pines compared to areas burned at moderate or low severity (Crotteau et al. 2013). Seed dispersal generally occurs within one to two tree heights, or 60 meters (200 feet), and long distance dispersal has been documented at 400 meters (1,300 feet) (Bonnet et al. 2005; Bohlman 2014). Areas that were likely to naturally regenerate were determined using a statistical analysis. Since it is more likely that areas adjacent to unburned and low-severity fire would have theoretically more seed sources, these were given a higher ranking than moderate severity fire. Using a 100 meter (328 feet) estimate of seed dispersal, a spatial map was created showing the locations in high-severity patches where natural regeneration had a high probability of success in the next decade. These areas were then identified as sites that would be monitored for natural regeneration. Refer to the "King Fire Vegetation Resilience and Restoration Assessment" (Appendix B)*" (FEIS, pg. 10).

It is analyzed in Chapter 3 of the FEIS that:

"*Damage or mortality of natural regeneration may occur during harvesting operations, particularly during ground-based harvesting operations (Donato et al. 2006). Areas where the risk of seedling damage or mortality is greatest would be within or near skid trails and landings. Damage to residual seedlings or natural regeneration is likely minimal based on the fact that the majority of harvest is proposed to occur in high mortality areas of the fire where a seed source is unlikely to provide natural regeneration*" (FEIS, pg. 207).

In this case, salvage logging is not expected to appreciably interfere with natural regeneration of trees as explained above. While some damage to natural regeneration is possible from proposed salvage logging it is not believed that this damage would be substantial, or that it would "commit resources prejudicing selection of alternatives before making a final decision" because of higher severity fire resulting in and expected low amount of available seed source and as such, limited natural regeneration. The proposal for reforestation provides management more options in reestablishment and maintenance of forest stands within the King Fire area.

It is further concluded in Chapter 3 of the FEIS that:

> "A strategy reliant solely on natural regeneration does not ensure achievement of the desired condition (density, species, and arrangement) of forest cover within the next several decades. Through reforestation efforts, managers can better control density, spacing, and species composition versus solely relying on natural regeneration. The cluster planting design proposed in this project is expected to establish stocking of desired species appropriate for the native conifer forest type at a density high enough to meet desired stocking levels, but low enough to create desired open canopied forested stands that complement any natural regeneration that may occur, in addition to providing for a more resilient structure for future fire management including prescribed fire use within these stands.
>
> A study by Donato (2009) appears to indicate a robust hardwood and shrub regeneration response after fires. The wide spacing patterns proposed in this alternative is well matched with variable seedling survival to produce a planting that mimics the heterogeneity and pattern of a naturally occurring forest as well as allow room for hardwood regeneration" (FEIS, pg. 208)

194. Comment (Commenter 21): Reviewing different methods of vegetation release, Forest Service PSW researchers McDonald and Fiddler (1993) concluded that, "If the goal is to create a forest with several age-classes and variable structure, but with slower seedling growth, longer time to harvest, and less species [conifer] diversity in early seral stages, then it is possible to accomplish this without herbicides and other means of vegetation control." SNEP, still considered "best available science" (see USDA SNFPA 2004, Vol. 1, p. 67) concluded, "All methods will release conifer seedlings from severe competition and enable the development of a new stand," and emphasizes that the objective of the land manager should guide the choice of vegetation management (SNEP, Volume III, p. 508). We conclude that it is therefore not essential to use chemical herbicides to achieve the stated purpose and need. We can see nothing in the purpose and need for the project that suggests that conifer growth, accelerated through the use of herbicides, is essential.

Response: The quote from McDonald and Fiddler (1993) in the comment is referring to a reforestation situation called clearcutting with reserves. This is unlike the situation in the King Fire where reforestation is providing the future conifer cover. McDonald and Fiddler (1993) also states that "herbicides are needed if forestry…is the goal, and if it is to be practiced in areas where sprouting and rhizomatous species clothe the land." In line with McDonald and Fiddler (1993), the analysis in Chapter 3 of the EIS shows the use of herbicides as necessary to efficiently and effectively achieve the purpose and need elements of actively managing the forest to achieve restoration and resilience. Proposed reforestation strategies provide a

reasonable means of achieving desired future structure and species composition with reduced cost and greater efficiency. As shown in the analysis in Chapter 3, without the use of herbicides, initial survival and growth would be much due to insufficient control of competing vegetation. Scientific literature referenced in Chapter 3 of the FEIS (pgs. 208 - 209) and reforestation of numerous fires on the Eldorado National Forest show that herbicide release provides for:

- Increased seedling survival and increased conifer species diversity with that increased survival,

  Decreased time needed to reach a height and structure where seedlings have an increased ability to withstand low intensity fire,

The increased cost of maintenance using only hand treatments rather than the combination of hand treatments and herbicide treatments proposed in the project would be very expensive and less effective in controlling competing vegetation. This leaves stands more susceptible to loss from both prescribed and wildfire for a longer time period and restricts the ability to maintain these stands in the future. While grubbing can cost as low as $250 per acre and can be effective if community is mostly grass and forbs or if shrubs are growing from seed rather than resprouting, in conditions other than that, the cost for treatment can go up to as much as $1,200 per acre on a single entry depending on shrub size. With repeated entries that can result in multiple thousands of dollars per acre for a not very effective treatment. Effectiveness of grubbing treatments is expected to be less than 1 season. Grubbing will need to be done annually to maintain seedlings, while still not providing desirable fuels conditions or stand development.

McDonald, P.M. and G.O. Fiddler. 1993. Feasibility of alternatives to herbicides in young conifer plantations in California. Can. J. For. Res. Vol. 23, 2015-2022

Alternatives

195. Comment (Commenter 21): The current proposed action and alternatives fail to rigorously explore and objectively evaluate a reasonable range of alternatives 40 CFR §1502.14. Reasonable in this context means to adequately consider alternatives that bring together fire-landscape realignment consistent with the best available science and your own specialist recommendations.

King Fire DEIS Fails to Consider an Adequate Range of Alternatives that Address Key Issues Raised in Scoping by Sierra Forest Legacy and by ENF Fire Specialists, Ecologists and Research Scientists. NEPA requires the Forest Service, based on the information and analysis disclosed in the Affected Environment discussion in the DEIS, to rigorously explore and objectively evaluate all reasonable alternatives (40 CFR §1502.14 (a)). NEPA also requires that the Forest Service devote substantial treatment to each alternative considered in detail (40 CFR §1502.14 (b)). Neither test was met in the King Fire DEIS documents. This is not to say that ecologists and fire specialists didn't disclose information regarding the detrimental impacts of the persistent lack of fire in the project area. They, in fact, did an excellent job of explaining the depth and details of fire history, fire as an ecological process, fire frequency, fire-return interval departure, fire severity class and effects and the need for fire frequency realignment. Evidently, their work failed to sway decision-makers away from a political driven proposal and toward a more science-based approach including increased fire use across the King Fire landscape.

Response: The FEIS describes reasonable alternatives considered in detail in Chapter 2 and analyzes the effects of those alternatives in Chapter 3. The FEIS also describes alternatives not developed in detail and briefly discusses the reasons for eliminating any alternatives in Chapter 2.

The FEIS explored and evaluated a reasonable range of alternatives and gave substantial treatment to each alternative considered in detail as required by 40 CFR Section 1502.14.

40 CFR Section 1502.14(a) requires an EIS to examine all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated (DEIS page 2-29). “All reasonable alternatives" has not been interpreted to require that an infinite or unreasonable number of alternatives be analyzed, but does require a range of reasonable alternatives be analyzed (USDA Forest Service 2012). A reasonable alternative should meet the purpose and need and address one or more significant issues related to the proposed action. No specific number of alternatives is required or prescribed (36 CFR §220.5(e)). Alternatives not considered in detail may include, but are not limited to; those that fail to meet the purpose and need, are technologically infeasible or illegal, or would result in unreasonable environmental harm (USDA Forest Service 2012, FSH 1909.15, 14.4). The range of alternatives considered includes all that are analyzed in detail as well as alternatives eliminated from detailed study (40 CFR §1502.14 and CEQ). 40 CFR Section 1502.14(b) requires an EIS to devote substantial treatment to each alternative considered in detail including the proposed action so that reviewers may evaluate their comparative merits.

The FEIS considered 5 alternatives in detail (action alternatives 2-5 and no action alternative 1) and another 6 alternatives were considered but were eliminated from detailed study (A-F). The 4 action alternatives considered in detail responded to significant issues identified in public scoping and also respond to the purpose and need. The alternatives were eliminated from detailed study because they were outside the scope of the need for the proposal, duplicative of the alternatives considered in detail, did not meet the Forest Plan, or were determined to have components that would cause unnecessary environmental harm (FEIS page 38). The overall range of alternatives considered included 11 in all, an adequate range of actions in response to public, administrative, and resource concerns.

Each alternative analyzed in detail received appropriate and substantial treatment as required by NEPA and in accordance with 40 CFR 1500.4(c) and 1500.4(g) (discussing only briefly issues other than significant ones… and using the scoping process not only to identify significant environmental issues deserving of study, but also to deemphasize insignificant issues, narrowing the scope of the environmental impact statement process accordingly). The FEIS included various analyses in Chapter 3 and the appendices and addressed impacts by alternatives, though where appropriate, discussions were grouped or lumped.

196. Comment (Commenter 21): In our SFL-King Fire scoping letter (dated 1-22-15) starting on p.1, we explicitly requested a long-term and fire-centric strategy specifically to address the lingering and often-repeated call for increased fire use in the scientific literature and from your own specialists and their reports, as is required by the governing forest plan. We established that the Sierra Nevada mixed conifer forests are a frequent low-and-mixed severity fire ecosystem (Collins and Stephens 2010, Perry et al. 2011) and that without early and frequent fire this portion of the dry, mixed conifer forest can never reach fire resilience or ecological integrity. This landscape will continue to cycle through larger, damaging, uncharacteristic fires (Stephens et al. 2014, Hurteau et al. 2014).

Consistent with our criticism of the King Fire DEIS purpose and need statement (above) it follows that the DEIS range of alternatives also lacks rigorous examination of issues such as fire use, fire-landscape realignment and a landscape fire reintroduction strategy raised in our scoping letter and by various specialists on the Eldorado National Forest based scores of papers cited in the scientific literature referenced herein.

The King Fire scoping review effort failed to grasp the connected actions proposed in our scoping comments and then proceeded to break out alternatives that effectively disassembled the coherence we strove for in describing a unified approach. First, we recommend a strategy for fire-landscape realignment and a return to management based on the ecological reality of the frequent low-and-mixed severity fire regime and fire return interval. This approach is very similar to the strategies proposed by zone ecologists and fire staff on the Eldorado National Forest (Estes and Gross 2015; King Fire DEIS-Appendix C).

Second, we recommended limited salvage logging focused on hazard tree removal, creation of strategic fuels management zones of limited size to support fire fighter safety while allowing rapid reintroduction of fire to support the need to mitigate fire behavior in the south portion of the burn and throughout the King Fire landscape as a whole.

Third, we proposed a limited, clumped "cluster" planting reforestation strategy taken after a reforestation presentation by Placerville District Ranger, Duane Nelson.While we support efforts to bring increased variability to any replanting effort, key principles need to be called out specifically.

Response: The alternatives analyzed in detail in the EIS were crafted in response to issues raised by the public, but which still allowed the Forest Service to meet the specific elements of the purpose and need. Alternative 3 was developed in coordination with Sierra Forest Legacy based on their scoping comments. This alternative limits salvage logging consistent with the second point in the comment and reduces the planting of trees per acre to the desired future condition values absent expected mortality. Clumped "cluster" planting reforestation strategies are part of all action Alternatives as described in Chapter 2 of the DEIS. Prescribed fire use was incorporated into alternatives 2-5 to varying degrees (addition of prescribed fire treatment on the south-facing slope above the Rubicon River for a total of 1,997 to 2,085 acres).

Prescribed fire use for future treatment of this landscape was explicitly addressed in the Fire Management Strategy within the King Fire (Appendix C) and is facilitated by treatments proposed under this project as noted above. The proposed activities in the King Fire Restoration project focuses on implementing actions that facilitate future management and resilience of the area and do not preclude the future widespread use of prescribed fire. As described in the purpose and need for the project, removal of dead trees in strategic areas of the fire is imperative to being able to manage this area in the future for both safety and resilience. At this time prescribed fire is not an effective treatment for much of the area of the fire that burned at high severity. It is expected that most areas that burned at high severity will not be ready for reintroduction of fire for the next 7 to 10 years due a lack of fine fuels that would allow fire to carry and consume some of the large fuels that have been left following the King Fire. While prescribed fire is an important tool for future management in the area, it is currently unknown where additional prescribed fire treatments would reasonably occur in the future based on effective and safe use of prescribed fire. A proposal for burning absent explicit definition of what is being planned would not meet FSH 1909.15_10_11.2 regarding identification of who, what, how, where, and when an action is being proposed. Other areas which burned at lower severity in the south end of the fire are being analyzed as part of the South Fork American River Cohesive Strategy and the John Don't Project. Because a specific proposal is not within the planning timeframe of this analysis it is expected that future NEPA documentation will be used to describe and analyze future burning within this landscape.

197. Comment (Commenter 21): We ask that the following Landscape Recommendations for Prescribed Fire from the Power Fire Ecological Framework (Estes and Gross 2015, below) be adopted directly into the King Fire FEIS/ROD:

PRESCRIBED FIRE

- Develop a fire strategy which details key locations for managing future fires and facilitating prescribed fire (e.g., ridges that surround logical fire sheds (Figure 8)). This should be completed in conjunction with key forest staff to identify both fire sheds and strategic fire locations where management would be distinct from the general forest.
- In areas, that weren't salvaged, prescribed fire might be a good tool in areas that are too steep to consider mechanical treatments. If these areas burned at high severity, prescribed fire may begin to reintroduce some heterogeneous conditions.
- In fire-prone areas, favor rapid development of fire-resistant stand structures insuring reforestation strategies allow for rapid reintroduction of fire into the burned landscape at various scales.
- Areas that burned at low and moderate fire severity (Figure 12) should be excluded from post-fire treatment (i.e. thinning and revegetation). These areas can be maintained through a robust prescribed fire treatment program to maintain the beneficial effects from the fire.

Response: The King Fire Project includes a fire management strategy (Fire Management Strategy within the King Fire) that is founded in the objectives described by the commenter. Key locations for managing future fires and facilitating prescribed fire are identified in this strategy. This strategy was developed prior to developing the Proposed Action for the King Fire DEIS and is included as Appendix C.

As part of this proposed project, 2,841 acres are proposed for treatment with prescribed fire within the next 5-7 years. This proposal addresses bullet point two targeting areas within the King fire perimeter that will not be managed using any mechanical mechanism but have been identified as key areas to begin to break up continuity of shrub regrowth. This will allow the development of multiple age classes of shrubs and trees benefiting both fire management and wildlife species that rely on early seral habitats. Additional use of fire to manage the landscape would be identified and analyzed in future NEPA documents.

Additionally, the proposed reforestation and release treatments favor the rapid development of fire resistant stand structures and allow for the rapid reintroduction of fire into the burned landscape at various scales. The reintroduction of fire could occur at various stages in the stand development to favor variable age and size classes as well as heterogeneous vegetation structures.

Areas that burned at low and moderate severity were excluded from salvage treatments except in strategic fire management areas and where hazard trees are likely to affect public and worker safety. These areas were not proposed for reforestation treatments. These areas were identified in Fire Management Strategy within the King Fire to be a priority for additional prescribed fires.

198. Comment (Commenter 21): The agency must include an alternative that utilizes only fire to maintain forest structure, composition, and ecological processes to maintain resiliency and species viability.

Response: A prescribed fire only alternative was developed for the FEIS based on this comment.

199. Comment (Commenter 21): All of the action alternatives should also demonstrate a methodology to maintain native diversity for the benefit of wildlife throughout the project area, including in planted areas. The planting schemes proposed thus far do not provide sufficient space for the maintenance of non-conifer species.

Response: Specific aspects of the action alternatives were included to provide diversity and natural range of variability (e.g. areas not proposed for treatment within the high severity patches retained to provide shrubs and other herbaceous cover types [FEIS page 10], varying planting pattern, species composition, and density to allow for development of a heterogeneous individual, opening, and clumped patterns given future predicted mortality and intermediate treatments including prescribed fire [FEIS page 11], and snag retention patches [FEIS page 14]. It is expected that a variety of of treatment types within the early seral coniferous forest will increase diversity and that areas not proposed for treatment in high severity patches will provide for shrubs and herbaceous cover, which reforested areas with release treatments will provide lower cover of shrub and additional cover of herbaceous vegetation.

The action alternatives focus reforestation efforts in conifer forests. Table 3EC.7 presents the percentages of each early-seral conifer type.

Cumulative Effects

200. Comment (Commenter 21): The DEIS is Lacking Important Information.
The cumulative effects are not adequately characterized, as there is no analysis of the environmental effects of the massive logging now occurring on private timber lands when combined with the proposed action. There is also no mention of past logging activities that contributed to the severity of the King Fire. There is no discussion of the role that the previous silviculture model played in the severity of impacts in the King Fire. This is one of the most serious cumulative effects that needs to be discussed, because in this proposal, the FS is planning to do it again.

Response: The cumulative effects were adequately addressed in the DEIS. Past, Present, and Reasonably Foreseeable Actions were discussed on DEIS pages 3-1 and 3-2 (pgs. 52 to 53 of the FEIS). Treatment of private land through salvage logging and reforestation is analyzed in the resource specific effects sections in Chapter 3 of the FEIS using a very conservative analysis assumption that the majority if not all of areas that were burned on private land within the King Fire would be salvage logged (e.g. FEIS pgs. 67, 241, and Appendix J). In practice it is evident that areas with remaining green trees are being left.

Cumulative effects analysis shall be carried out in accordance with 40 CFR 1508.7 and in accordance with The Council on Environmental Quality Guidance Memorandum on Consideration of Past Actions in Cumulative Effects Analysis dated June 24, 2005. Management prior to the King Fire is discussed on page 130 and pages 195 to 196 of the FEIS:

"*There are some areas where plantations or prior fuel treatments (thinning and machine piling) changed King Fire behavior. This tended to occur when fire behavior was moderated because of weather or because it was burning laterally with less intensity. Fire often moved around very young plantations or dropped to the ground and burned as a surface fire in thinned areas*"

"*As with many areas in the Sierra Nevada, the landscape of the King Fire has been heavily influenced by past management activities that include mining, grazing, railroad logging, lack of management, and fire exclusion. At the landscape level, the combination of past management activities and fire exclusion had created relatively homogeneous areas typified by small trees existing at high densities (Oliver et al. 1996). Prior to the King Fire, the vast majority of conifer dominated stands in the project area were comprised of high amounts of shade-tolerant species such as white fir and incense cedar. Dense stands with high accumulations of ladder and canopy fuels created conditions vulnerable to stand replacing high-intensity wildfire. Efforts to reduce fuels and improve forest health based on direction in the 2004 SNFPA had been designed for the landscapes within the fire perimeter; however, only the Hartless, Hey Joe, and Misfire Projects had been completed. Additional projects were in various stages of implementation including the 2-Chaix and the Blacksmith Projects, which would have provided treatment in the vicinity of Big X and Chaix Mountains, Pigeon Roost, and portions of the Rubicon River Canyon. Planning was completed for these projects, but implementation of fuels reduction efforts had not yet begun. Implementation of the Big Grizzly Project on the ridges above the Rubicon River including the Nevada Point Ridge area was underway, but had no areas where all proposed treatments for fuels reduction were complete. Older projects designed under the CASPO Interim Guidelines, implemented 15 to 20 years prior to the fire, had little to no follow-up maintenance resulting in ingrowth of shrubs and small trees and accumulation of dead and down material trending stands away from desired conditions for fuels management prior to the King Fire*".

The comment concerning "… *the role that the previous silviculture model played in the severity of impacts in the King Fire*." is complex to ascertain in terms of spatially and temporally where a variety of management actions have occurred and not occurred. The two preceding paragraphs describe some of this complexity. In addition, there has been no single silvicultural treatment or model used in the management of the area burned by the King Fire. Although, it is true that much of the land, both public and private, has had various harvest prescriptions applied for decades, it is also true and important to understand that significant portions of the King Fire area had never been subject to any timber harvest, including the major canyons, such as the South Fork of the American River, Silver Creek and the Rubicon River Canyon. It is quite likely that the terrain, alignment and vegetation in these canyons played a significant role in terms of ultimate fire behavior both in previously harvested or unharvested timber stands.

In terms of general timber management within the burn area, outside of the major canyons, a variety of silvicultural prescriptions have been applied over the years, including several thousand acres of treatments designed and intended to change fuel profiles and reduce fire intensity. Many of these fuel treatments were successful in ameliorating fire behavior, but unfortunately many were not, particularly during the several hours when the King Fire became a plume dominated fire, generating its own winds and traveled multiple miles in a very few hours from near Pollock Pines to Hellhole Reservoir.

Other than timber management prescriptions designed for fuel reduction purposes, silvicultural prescriptions over the years have included overstory removals, clearcuts, insect salvage, shelterwoods, fuelbreak treatments and various intermediate thinning treatments. Although, there were a variety of silvicultural treatments resulting in variable vegetation conditions on the ground, during the major fire run of the King Fire there was very little difference in terms of stand survivability, i.e. nearly all timber and other vegetation in the way of the fire front was killed. It is reasonable to surmise that in order to survive the fire, the timber stands in front of the fire would have needed to be much less dense than what is currently deemed to be desirable for those wildlife species that are dependent upon closed canopy, old growth stands. It is also quite likely that had there been large areas consisting of large, open-grown pine with a low

density of smaller trees; greater stand survival would have been likely. To achieve such stand conditions on a large scale, many changes need to be made in terms of how we integrate all the competing and conflicting goals we have currently tried to embody in our management objectives. To presume that it has simply been the application of the incorrect "silvicultural model" greatly over-simplifies the situation.

201. Comment (Commenter 21): The DEIS failed to disclose the lost value of trees that burned in the existing plantations. This is relevant information and should be included for the public and decision makers to consider before making a decision to do the same thing again. Similarly, the cost of extinguishing the fire should be disclosed as part of the analysis. This is also connected to the hazardous fuel configuration of the area due to the previous episodes of green tree and/or salvage logging and plantings. These are connected actions and have resulted in significant cumulative impacts.

Response: Connected Actions are defined as actions that: (i) automatically trigger other actions which may require environmental impact statements. (ii) cannot or will not proceed unless other actions are taken previously or simultaneously. (iii) are interdependent parts of a larger action and depend on the larger action for their justification. (40 CFR 1508.25). While they may be of consideration, the lost value of trees that burned in the existing plantations, and cost of extinguishing the fire do not meet the definition of connected actions.

The loss of plantation trees in the King Fire are difficult to value as the recreation, habitat, clean water, carbon sequestration value, and other non-monetary values of the plantation cannot be easily valued in terms of dollars. Many plantations that were burned were non-commercial in size. The value of commercial plantations would depend upon the timber markets at the time of purchase. The cost of planting and release would have depended on the stand conditions methods available at the time and chosen prescriptions for treatment implemented. As the objectives for Forest Management have changed over time and shifted from a policy of commercial wood production to an ecosystem restoration focus in Region 5 the value of planting and tending these trees would need to somehow be valued against the benefits of these stands during their life.

The cost of suppressing the fire was a factor of the fire weather, the fuels condition, and the values at risk. It was identified prior to the fire that the landscape was at risk from high intensity fire and efforts to reduce fuels in strategic areas were on going. Along with the difficulty to implement prescribed fire and an ongoing history of fire exclusion, the protection of ESA listed and sensitive species was a factor in the limited treatment and maintenance of areas in King Fire. Timber stands and plantations that had been thinned only; or thinned and prescribed or in some cases just masticated burned were fairly successful in many instances in modifying fire behavior during the King Fire; however the limited extent of these treatments indicates treatments need to be more extensive to effectively influence fire effects during extreme fires. Fire behavior experts conducting multiple field reviews since the fire have largely concluded that certainly on Pacific Ranger District, the rather extensive history of fuel treatments was likely to have been substantially responsible for the less intensive fire behavior which resulted in more of a mosaic burn.

As noted on page 144 of the FEIS:

"*Suppression costs are increasing due to several reasons that can be categorized according to social environmental, institutional, and operational factors. The most popularly cited reasons for rising suppression costs are the social environmental factors of excess fuel accumulations.*"

The proposed reforestation analysis includes an economic analysis of differing reforestation and release methods in Chapter 3 of the FEIS. As shown in the analysis of Chapter 3 the proposed reforestation would allow for more flexible management options including increased ability of the plantations to survive both prescribed and wildfire.

Forest Plan

202. Comment (Commenter 21): We understand that managing unplanned ignitions for resource benefits are not allowed under the current forest plan; therefore, we ask that a non-significant forest plan amendment be proposed in this EIS that creates a King Fire-Fire Management Plan that allows for unplanned ignitions to be managed for multiple natural resource benefit.

Response: Developing a King Fire – Fire Management Plan that allows for managing unplanned ignitions for resource benefits is outside the scope of this analysis.

The 2004 Sierra Nevada Forest Plan Amendment (ROD, pg. 35) allows for managing natural ignitions: "Lightning caused fires may be used to reduce fuel loads or to provide other resource benefits, such as conserving populations of fire-dependent species. Before wildland fires can be used, national forest managers must prepare a fire management plan that describes how prescribed fires and naturally caused wildland fires will achieve resource management objectives." A Fire Management Plan that includes direction for managing unplanned ignitions to achieve multiple resource benefits will be developed and analyzed at the forest-wide scale as part of Forest Plan Revision, which is expected to begin within the next few years.

Proposed Action

203. Comment (Commenter 21): The majority of the King Fire area has seen little fire in the past century (DEIS 3-53). The yellow pine and dry mixed conifer forests within the King Fire supported frequent fire and display a pre-European fire return interval (FRI) of about 11 years. In other works, these forests evolved with a fire approximately every 9.1 years over the past century (Van de Water and Safford 2011). It is clear there is a need to increase the use of managed fire for multiple resource benefits. The most effective way to increase resiliency and the number of acres treated is to transition away from a suppression dominated and reactionary fire policy and begin implementing a landscape-wide fuels management program that uses fire to mimic natural fire regimes and allow the use of natural ignitions or "free-burning fires" to "regulate fire-induced effects across the landscape" (North et al. 2009). In other words, the best way to limit fire size and uncharacteristic fire effects is when fire burns into recent fires and eventually becomes self-regulating (Falk 2006; Stephenson 1999; Collins et al. 2009).

The Region 5-Sierra Forest Legacy Managed Fire MOU is a positive step in overcoming constraints to implementing a landscape-wide prescribed fire program. On national forests the first step to overcoming these constraints is to plan as though they will be overcome by including landscape plans, staffing and operational capacity necessary to do active burning. A large-scale prescribed fire program is the only option available to perpetually reduce fuels and reduce the economic impacts of mega fires as well as maintain ecological integrity across the landscape and ensure subsequent fires are more likely to burn less severely and within NRV. Consider the result of study on fire reburn severity in Yosemite National Park by van Wagtendonk et al. (2012):

> "Second and third fires reburned larger areas at high severity when the time between fires was nine years or greater, and nearly half of the original high severity areas reburned at high

severity. The third and fourth fires did not burn at high severity when the return interval was less than nine years. These changes indicate that the effect of fuel reduction is offset by fuel accumulation over a nine-year period. Fuel accumulations and deposition rates determined by van Wagtendonk and Sydoriak (1987) and van Wagtendonk and Moore (2010) substantiate that nine years is sufficient time for fuels to recover to their pre-burn levels."

Based on the concept that historic fires limited fire size of current burns, there is an immediate need to return fire to the system within 5-10 years and any delays will have ecological consequences that affect the resiliency of the succeeding forest. The notion that the Forest Service "may contemplate future projects to address ecosystem restoration and resilience such as prescribed fire or additional fuels treatments" is not acceptable. Instead, developing an active (and early) fire restoration program for the King Fire landscape should be the very foundation of this proposed action.

Response: Current fire return intervals have been recognized and the importance is a major focus in development of projects, including the current project. Although the Forest Service recognizes that prior to the King fire a large portion of the landscape had no recorded wildfires since 1908, the King fire itself has created a changed landscape. As a result, the strategy for reintroducing fire to the landscape is slightly modified when compared to the unburned parts of the forest. This strategy is detailed in the Fire Management Strategy with in the King Fire. The focus within the fire perimeter is the 1) reintroduction of fire on a short rotation interval to break up the continuity of post-fire fuels, 2) maintenance of areas that burned at low and moderate severity within the pre-European fire return interval, and 3) facilitate prescribed fire in projects under previous decisions (FEIS, Appendix C, pg. 14). Under this project only bullet 1 was analyzed as 2 and 3 are out of the project scope.

Changing fire management policies, analysis and development of landscape fire management plans and increasing operational capacities are outside the scope of this project. The Eldorado National Forest is about to enter the process of updating the LRMP and Fire Management Plan. This update encourages consideration of landscape-scale fire management approaches (e.g., cross-jurisdictional operations), such as increasing prescribed fire on landscape scales, a greater use of wildland fire for resource objectives, and the potential effects of climate change. Although there are significant barriers in the use of wildland fire, federal land management agencies have the opportunity to address these impediments during the land management plan collaborative revision processes. During this process, land management planners incorporate new federal policy direction and science information in the land management including information from Meyer et al (2015).

The Eldorado National Forest and USFS Region 5 generally agree that more prescribed fire and management of natural ignitions in the Sierra Nevada mixed conifer landscapes is beneficial to ecosystems, landscapes and communities. Due to the complexities of prescribed burning, land managers employ many other tools in order to reach the desired condition and the purpose and need for the King Fire Restoration project. The proposed treatments include reforestation and release treatments that favor the rapid development of fire resistant stand structures and allow for a quicker reintroduction of fire into the burned landscape at various scales than with limited treatment. Since the King Fire is so vast and complex, the King Fire Restoration project is a first step in restoration process. After the King Fire Restoration Project decision is made, the Forest Service fully expects to engage in further restoration and rehabilitation activities such as prescribed fire and other fuel treatments specific to the needs of specific areas.

The extensive private properties within the King Fire perimeter in many cases do not align with the safest holding locations for a landscape prescribed burn to be successfully and safely

implemented on federal lands. Any prescribed burn or wildland fire has the potential to affect many people, especially the private properties within and immediately adjacent to the King Fire perimeter. In the King Fire landscape approximately 5-10 years from now would be more approriate time frame for proper project design and collaboration to accomplish the most effective planning and implementation process.

There are numerous outside influences, laws, and policies that have prevented prescribed fires and management of natural ignitions from being implemented across the ENF as freely as described in the public comment above. In recent years, prescribed burning has received significant scrutiny among the public and elected officials which in turn may have caused land managers and burners in some cases to become more risk adverse. Forest Service agrees that a consistent and timely educational message to the public would be instrumental in gaining favorable public opinion for prescribed burning and management of natural ignitions for resource benefits, however this is outside the scope of this project.

Falk et al (2006) proposes a ‘‘process-centered’’ framework that places central emphasis on ecological functions and ecosystem processes as opposed to a reference condition that is static over time. The authors indicate that positive feedback relationships in ponderosa pine types would tend to reinforce a particular range of fire behavior. Thus, the structure–process relationship may consist of two stable equilibria; open stand conditions promoting continuous herbaceous cover, which facilitates further surface fires, and dense stand conditions, leading to longer fire intervals and episodic crown fires. Between these two basins of attraction, however, may exist an unstable domain where significant departures from natural structure or process can drive the system toward an alternative state. Therefore just letting any process take place does not by definition does not constitute the restoration of an area to an ecologically functioning system.

Meyer, M.D., S.L. Roberts, R. Wills, M. Brooks, and E.M. Winford. 2015. Principles of effective USA federal fire management plans. Fire Ecology 11(2): 59–83. doi: 10.4996/fireecology.1102059

204. Comment (Commenter 21): We further note that in the current forest plan Fire and Fuels Management strategy, goals, and standards and guidelines, the Forest Service is directed to “Complete a landscape–level design of area treatment patterns prior to project-level analysis. Develop the treatment **patterns using a collaborative multi-stakeholder approach**. Determine the size, location, and orientation of area fuels treatments at a landscape-scale” (2004 SNFPA ROD, p. 49, emphasis added). The goal of the Fire and Fuels Management Strategy requires a landscape scale approach to result in conditions that permit re-introducing fire into fire-adapted ecosystems. The proposed plantation scheme in the DEIS fails in this regard.

Response: The strategy for reintroducing fire to the King Fire landscape is detailed in the Fire Management Strategy within. the King Fire. The focus within the fire perimeter is the 1) reintroduction of fire on a short rotation interval to break up the continuity of post-fire fuels, 2) maintenance of areas that burned at low and moderate severity within the pre-European fire return interval, and 3) facilitate prescribed fire in projects under previous decisions (FEIS, Appendix C, pg. 14). Under this project only bullet 1 was analyzed as 2 and 3 are out of the project scope.

Plantation management is a component within the Fire Management Strategy within the King Fire (FEIS Appendix C) and meets the purpose and need number 3) “Actively manage severely

burned areas to facilitate restoration and resilience". The combination of planting configuration with release treatments were designed to facilitate prescribed fire treatments in the near future (10-15 years) as described on page 11 of the FEIS.

The Sierra Nevada Forest Plan Amendment was initiated in part to pursue more aggressive fuel reduction treatments (USDA Forest Service 2004). Strategic Landscape Area Treatments (SPLAT) was the fuel strategy developed by forest and fire management staff following the 2004 Sierra Nevada FSEIS. The SPLAT approach is based on the theory (Finney 2001) that disconnected fuel treatment patches that overlap in the direction of the head fire spread reduce the overall rate and intensity of the fire in a forested landscape.

USFS commonly have multiple land management objectives not only reducing fire hazards and potential fire behavior by aggressive fuel reduction treatments. The result is some compromise in SPLAT arrangement to accommodate the other forest management objectives. Implementing the SPLAT strategy across the landscape has been limited by steep slopes and land allocations such as Protected Activity Centers and Home Range Corridors, which require higher density stands and restrict treatment types.

Prior to the development of the King Fire Proposed Action a fire management strategy was developed, which details key locations for managing fires and facilitating prescribed fire. This strategy is included in the FEIS as Appendix C. The strategy was designed to be dynamic so that as new science and planning documents become available, updates can be made to reflect these on the landscape. The King Fire Restoration project provides the first steps in accomplishing treatments to implement this strategy.

The Eldorado National Forest is about to enter the process of updating the LRMP and Fire Management Plan. The LRMP update encourages consideration of landscape-scale fire and fuel management approaches (e.g., cross-jurisdictional operations), such as increasing prescribed fire on landscape scales, a greater use of wildland fire for resource objectives, and the potential effects of climate change. The LRMP is a collaborative multi-stakeholder approach.

Finney, M.A. 2001. Design of regular landscape fuel treatment patterns for modifying fire growth and behavior. Forest Science 47: 219-228.

205. Comment (Commenter 21): Finally, we ask that you remove all skyline logging from the final decision due to the ineffectiveness of this logging method to reduce fuel loading and because you did not compare the effectiveness of skyline logging in modifying fire behavior to the no action alternative and you did not disclose the cost of skyline logging vs. the timber revenue that would be produced by such an activity. Given that you propose to leave 18 inches of slash and debris scattered throughout cable-logged units, compared to whole tree yarding in ground-based units that leave little slash and debris, one would assume that the potential fire behavior after cable logging would be significantly different than from ground-based logging with whole tree yarding. For instance, studies in the Pacific Northwest found that salvage logging operations that included lop and scatter of branches, limbs, and tops found that small and medium diameter dead woody surface fuels, which actively burn at the fire front and contribute most to fireline intensity, were greater in logged areas than untreated areas in the short term (Donato et al. 2006; McIver and Ottmar 2007) and were predicted to remain higher in these areas for approximately 20 years (McIver and Ottmar 2007). In addition, there were areas that had been cable-logged and then burned in the American Fire on the Tahoe National Forest, these areas had near 100% tree mortality due to high soil heating from logging debris left on site, despite low flame lengths, yet adjacent untreated areas experienced low to moderate fire severity effects.

Response: Skyline logging units were proposed for inclusion because they specifically met one or more aspects of the purpose and need, most often the need to actively manage severely burned areas to facilitate restoration and resilience by reducing fuel loads in these areas. The potential impacts from these proposed activities were analyzed in Chapter 3 of the EIS.

Post-fire logging can serve as an effective tool for managing fuel loadings in the forests regenerating after high severity wildfires (Peterson, Dodson, & Harrod, 2014). The direct effect of salvage harvest is in reducing density of snags on the landscape (Ritchie, Knapp, & Skinner, 2012) and subsequently reducing future accumulations of large diameter surface fuels as trees fall to the forest floor.

Post-fire logging transfers woody debris in tree branches and tops from the canopies of fire-killed trees to the forest floor, producing well-documented conditions of higher surface woody fuels in logged stands than in unlogged stands in the first 1–4 years following logging (Donato et al., 2006, 2013; McIver and Ottmar, 2007; Monsanto and Agee, 2008; Keyser et al., 2009). Higher amounts of surface woody fuels– especially small and medium diameter woody fuels – can increase short-term fire hazards in logged stands by increasing potential rate of spread and fire-line intensity (Donato, Fontain, Campbell, Robinson, Kauffman, & Law, 2006) , but actual fire risks are low unless there are enough fine fuels (e.g., litter, grass, and shrub fuels) to carry fire through the logged stand and there are sufficient fuels in surrounding stands to allow wildfires to spread into or away from the logged stand.

The period of elevated hazards is also relatively short-lived, as deposition and accumulation of surface fuels from decaying snags causes mean surface fuel loadings in unlogged stands to exceed those in logged stands within 5–10 years after wildfire (Monsanto & Agee, 2008).

The references from the commenter address some of the effects that salvage harvest can have on fire behavior and fuel loadings. These studies focused more on short term fire behavior effects in these stands (untreated, treated, planted), but did not look at the long term fire effects, future fire severities, and safety issues that are associated with a high concentration of large logs (standing snags and 1000 hour surface fuels) on the landscape.

Skyline logging has low impact to soils, and the stumps would be left in place to help continue to stabilize these slopes. A much greater potential impact to soils could occur from a high intensity fire burning through the standing material once it has fallen, causing more severe damage to the soil resource. In most cases, these steeper slopes are in key areas adjacent to PACs, other surviving green areas, and proposed reforestation areas that are important to protect from future high intensity wildfires and maintain for long-term forest viability. Others are proposed within strategic fuel reduction areas adjacent to strategic infrastructure.

The value of the timber shown in the Economic Analysis in Chapter 3 of the FEIS is the positive revenue that is expected for logs delivered to the mill for each alternative based on the harvest systems included, and includes the cost of waterbarring, hauling, and other associated stump to truck and truck to mill costs for both mechanical and skyline logging units. Cost and revenue of skyline harvest units were calculated as part of the total cost and revenue of the salvage in each alternative. The cost for stump to truck for a skyline harvest system is slightly higher that for a mechanical system (currently about $95 dollars per ccf versus $75 dollars per ccf for mechanical harvest). Timber is sold by species with one price for all timber regardless of harvest method rather than separated by harvest method, and many costs such as road watering and hauling are spread across all the units in the area, and therefore unreasonable to separate. A unit by unit analysis for cost and value is not reasonable, or relevant to this decision, since units where the value of the commercial trees are less than the cost of removal, would still be treated to meet the purpose and need of the project.

Purpose and Need

206. Comment (Commenter 21): The current proposed action violates requirements for a meaningful purpose and need that addresses key issues with scientific integrity 40 CFR §1502.24.

Response: Per 40 CFR 1502.13 (Purpose and Need), "The statement shall briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action." 40 CFR 1502.24 states that "Agencies shall insure the professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements…"

As described in the FEIS (pg. 5 to 6), the proposed action was developed to meet the purpose and need. The purpose and need is summarized on page xii and is described in detail on pages 4 to 5 of the FEIS. The Ecological Analysis – Comparison to Natural Range of Variability, Vegetation Resilience and Restoration Assessment, and Fire Management Strategy (DEIS appendices A-C), as well as other best available science, provided context and background for development of the purpose and need (which was developed based on comparing existing conditions with the Forest Plan desired future condition). Considerations in developing the proposed action are described in the FEIS (pgs. 9 to 11) and reference best available science that was used to support the proposed action and alternatives. The purpose and need and proposed action were developed consistent with 40 CFR 1502.13, and the King Fire Restoration Project FEIS was developed using best available scientific literature consistent with 40 CFR 1502.24.

207. Comment (Commenter 21): The King, Rim, Biscuit, Rodeo-Chediski, Wallow, and dozens of other so called "megafires" that have burned over the past 15 years in the fire-adapted forest of the west indicate to us that achievement of landscape level resiliency must include the use of wildfire and prescribed fire to achieve ecological benefit. We call this term fire-landscape realignment (Power Fire Ecological Framework 2015) since the goal is to realign the landscape with its recognized fire frequency and natural fire regime. The current purpose and need emphasize management actions to support a strong fire suppression response, yet a successful long-term strategy for this landscape will not be successful if it relies on the use of suppression. Fire suppression and mechanical fuels treatments failed to halt the King Fire from burning at previously unseen intensity and severity yet the Forest Service seems set to reestablish the same conditions (no large-scale fire strategy, flammable high-density plantations, no response for the 80,000 acres not included in the current proposal that will need fire returned in the next decade), that burned last summer, praying that somehow the outcome will be different when the next fire comes. The King Fire Restoration project is the best opportunity to establish a refined purpose and need to use fire at the landscape scale to achieve appropriate ecological benefits of fire and forest resilience, carbon stability, and improved public safety.

We restate from our scoping comments, the recent scientific literature supports the idea that the mixed conifer forest of the Sierra Nevada were characterized by frequent mixed severity fires (Collins and Stephens 2010, Perry et al. 2011). Mixed severity fire includes stand-replacing patches within a matrix of low and moderate fire-induced effects (id). The title of the proposed action is "King Fire Restoration Project." According to the 2012 planning rule, restoration is defined as: "The process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed. Ecological restoration focuses on reestablishing the composition, structure, pattern, and ecological processes necessary to facilitate terrestrial and aquatic ecosystems sustainability, resilience, and health under current and future conditions." A

significant and glaring omission from the purpose and need as it relates to the title of the proposed action is the purpose and need statements do not include reestablishing the ecological processes necessary to facilitate sustainability, resilience, and health under current and future conditions, in other words, fire-landscape realignment. In the case of Sierra Nevada mixed conifer forests, that ecological process is unquestionably frequent mixed severity fire, and without it, restoration, by definition, cannot and will not occur.

The long-term fuels strategy should be inclusive of fire and not suggest that treatment areas are solely designed to allow effective fire suppression. Under certain conditions, like those experienced on day four of the King fire, suppression may not be effective or possible. While fire suppression and State mandated homeowner fire clearance (PRC 4291-4299) plays a key role in protecting homes and communities, outside of the WUI, fire suppression and fire exclusion are significant barriers to implementing a large-scale fire and fuels management program (USDA 2011, Ecological Restoration Leadership Intent, p. 2). The forest should recognize the King Fire as an opportunity, both ecologically and economically, to reintroduce fire at a scale appropriate to the Sierra Nevada forests. North et al. (2012) highlights the pressing need to use fire to treat fuels at the landscape scale, stating:

> "With less than 20% of the Sierra Nevada's forested landscape receiving needed fuels treatments, and the need to frequently re-treat many areas, the current pattern and scale of fuels reduction is unlikely to ever significantly advance restoration efforts. One means of changing current practices is to concentrate large-scale fuels reduction efforts and then move treated areas out of fire suppression into fire maintenance. A fundamental change in the scale and objectives of fuels treatments is needed to emphasize treating entire firesheds and restoring ecosystem processes. As fuel loads increase, rural home construction expands, and budgets decline, delays in implementation will only make it more difficult to expand the use of managed fire. Without proactively addressing some of these conditions, the status quo will relegate many ecologically important areas (including sensitive species habitat) to continued degradation from either no fire or wildfire burning at high severity."

According to the law of unintended consequences, "An intervention in a complex system tends to create unanticipated and often undesirable outcomes."2 Post-fire salvage logging and reforestation (tree planting coupled with herbicide applications) has become standard management, according to conventional silvicultural practices, despite several decades of evidence that "undesirable outcomes" are almost guaranteed to result, especially in California's dry, fire adapted interior forests. The purpose and need must address fire-landscape realignment and the lingering impacts of fire exclusion.

NEPA 40 CFR § 1502.13 requires disclosure of a purpose and need for action in any EIS. The King Fire Purpose and Need (p. xiii) includes six actions to be pursued by the Forest Service as part of the DEIS. Item #3 is to, "Actively manage severely burned areas to facilitate restoration and resilience."

Contrary to NEPA's requirements to scientific and professional integrity (§1502.24), the Eldorado National Forest has ignored fire use as an early and active management tool that would actually create the long-term resilience sought after in the purpose and need. Trying to describe a vision of resilience that excludes or ignores the primary disturbance process that delivered resilience in the Sierra Nevada for the past 10,000 years (SNEP Vol. II, Section IV; Sugihara et al. 2006; Stephens et al. 2007) is arbitrary and lacks scientific credibility. Further, suggesting that "we'll do prescribed fire in the future" does not hold up under scrutiny. The Peavine Point RNA has had a prescribed burn planned in its perimeter for years (to be implemented in 2010-2011),

but never was implemented and tragically burned in the King Fire, mostly at high severity, due to missed fire return intervals and high fuel loads.

The purpose and need fails to identify specific actions and commitments needed to begin a long-term restoration plan. While suggesting resilience in words, actions speak otherwise. In DEIS p. 3-143 &144 there is an explanation of various reasons for why some areas of the King Fire burned:

- "At a Landscape level, the combination of past management activities and fire exclusion had created relatively homogenous areas typified by small trees existing at high densities (Oliver et al. 1996)."

- And at the project level, "Older projects designed under the CASPO Interim Guidelines, implemented 15 to 20 years prior to the fire had little or no follow-up maintenance, resulting in an ingrowth of shrubs and small trees and accumulation of dead and down material trending stands away from desired conditions for fuels management prior to the King Fire."

The explanation above is an honest one but not comforting for those of us thinking that the King Fire's intensity might have jarred the Forest Service out of the old paradigm (very limited fire use, no follow-up maintenance to retain treatment resiliency, and high-density plantation forestry which contributes to high severity effects) (see Stephens and Moghaddas 2005).

Response: After the King Fire, the ENF recognized a need to identify a strategy for managing activities within and adjacent to the footprint of the King Fire to assist with future fire management of planned and unplanned ignitions. The "Fire Management Strategy within the King Fire" (FEIS, Appendix C) provided a landscape strategy for planned and unplanned ignitions in the King Fire. The strategy was designed to be dynamic so that as new science and planning documents become available, updates can be made to reflect these on the landscape. The strategy strives to provide: 1) resilient forest vegetative communities to predictable occurrence of future fires, 2) sustainable habitat for native biotic communities, and 3) reduce the risk of large-scale disturbances that have the potential to impact communities, watersheds, and ecosystems.

As part of this strategy the King Fire Restoration project identified purpose and need element 2 for "Remove dead trees in strategic fire management areas to improve the agency's ability to manage and control future fires: Strategically located fire management areas facilitate the effective suppression and control of unwanted future fires and provide control lines for the application of future prescribed fires in the project area" and purpose and need element 3 "Actively manage severely burned areas to facilitate restoration and resilience".

The proposed reforestation and release treatments favor the rapid development of fire resistant stand structures and allow for the rapid reintroduction of fire into the burned landscape at various scales. Furthermore planting configuration and release treatments were designed to facilitate prescribed fire treatments in the near future (10-15 years) as described on Page 2-4 of the DEIS.

As identified by the commenter, the Eldorado National Forest has had several prescribed fire projects analyzed and waiting for implementation including the Peavine Point RNA prescribed burn and a prescribed burn in the Rubicon Canyon. We agree that prescribed fire is an important and critical tool in forest management, however due to limitations in implementation of prescribed fire, as illustrated by the Peavine Point RNA burn, relying on only prescribed fire to achieve management objectives following the King Fire would not result in meeting the purpose

and need for the project. The project proposal is designed to facilitate future prescribed fire use while also allowing for other treatments to restore and maintain forests in this landscape.

North et al. (2012) main management recommendation was the inclusion of low to moderate severity fire in our current planning process to use fire as a compliment to other treatments to more effectively treat the landscape, not to exclude mechanical treatments in lieu of prescribed fire treatments.

208. Comment (Commenter 21): Fire return intervals should be consistent with the vegetation type, elevation, and topography. The Forest Service has known this fire interval information for a long time and can no longer maintain credibility as a land management agency while at the same time ignoring the primary disturbance process functioning in the Sierra Nevada of the past 10,000 years.

Response: Fire frequencies are often measured by fire return interval which is the number of years between fire events. Fire frequencies can be measured in a variety of methodologies. In order to get a robust estimate, the analysis in the King Fire utilized Van de Water and Safford (2011) who conducted an exhaustive review of the published and unpublished literature to determine fire return intervals observed prior to significant Euroamerican settlement (i.e., the middle of the 19th century). The NRV for fire frequencies in the vegetation types found in the King fire were drawn from estimates made for the Southern Cascades and Sierra Nevada. The mean FRIs ranged from 11-16 years in yellow pine and mixed conifer forests, and median FRIs ranged from 7-12 years. Mean minimum FRIs were around 5 years for both forest types, and mean maximum FRIs ranged from 40-80 years (Van de Water and Safford 2011, Safford 2013).

Current fire return intervals have been recognized and the importance is a major focus in development of projects. One critical piece of information that is missing from this comment is the overall changes that have occurred over the past 100 years of fire exclusion making it extremely difficult to return a system to a proper fire return interval. This process will take additional management actions over the next several decades that are beyond the scope of this project and are detailed in the Fire Management Strategy within the King Fire Area (Appendix C).

209. Comment (Commenter21): As far back as the CASPO Technical Report (Verner et al 1992) p. 248, the authors stated, ". . . using a conservative mean fire return of 20 years for the 586,000-acre Eldorado National Forest (NF), we would expect a mean of 29,000 acres to burn annually." In fact, only roughly 14,000 acres burned in the 20-year period from 1970-1990 equaling an average of 664 acres/yr.

Now we are commenting on another large fire "restoration" project where no reasonable, frequent landscape fire use in referenced in the DEIS or committed to in the proposed action or alternatives. While recent climate models suggest increased fire activity (Lenihan et al. 2008), and forests trending to chaparral and early seral vegetation, the King DEIS appears non-responsive on how to deal with likely increases in fire activity and the predicted rapid warming currently occurring (Safford 2013). Absent a clear proposal purpose of using fire to mitigate future negative fire effects, at the landscape level, the Eldorado NF places its head in the sand by ignoring climate projections. No part of the King Proposed Action takes this landscape toward fire realignment and NRV for fire frequency on this landscape. The 2800 ac Rubicon Canyon burn proposed on the south-facing canyon is mostly hardwoods. While important, this action is a tiny fragment (3%) of the needed fire commitment for the King Fire landscape.

Response: Removal of hazard trees and of fire killed trees within the strategic fire management areas in low and moderate severity areas of the King Fire are within the scope of the project. Additional management actions such as thinning of green trees and additional prescribed fire use to further reduce fuel accumulations within these areas are not within the scope of this project.

The purpose and need for the King fire project were identified as 1) Reduce the risk from falling dead, dying, and damaged trees that pose a significant safety concern to forest visitors and workers, and create a hazard to private property, infrastructure, and cultural resources; 2) Remove dead trees in strategic fire management areas to improve the agency's ability to manage and control future fires; 3) Actively manage severely burned areas to facilitate restoration and resilience; 4) Balance active management with the retention of important attributes of post-fire habitat at the landscape scale and within treatment areas to support the diversity and abundance of species; 5) Expeditiously recover timber killed by the fire commensurate with available markets for the purpose of generating funds to offset the cost of restoration activities and contribute to societal needs for wood products; 6) Promote scientific research to increase knowledge regarding the effects of large fires on the environment, how to reduce the risk of future fires, and how to restore resilient forests after fires.

Future decision documents would be needed to address additional management efforts in the low to moderate severity areas of the King Fire including thinning of green trees and additional prescribed fire. These additional actions that would be addressed under a separate decision as these actions are out of the scope of this project.

210. Comment (Commenter 21): The Power Fire Ecological Framework (Estes and Gross 2015) commissioned by and for an adjacent ranger district on the ENF, analyzed a similar landscape that recently experienced a range of fire effects. The authors are clear about the importance of prescribed and managed fire as key restoration tools for restoring large landscapes. They state, "Fire is an indispensable management tool, capable of doing much of the work to restore ecological processes (Stephenson 1999, Sugihara et al. 2006, North et al. 2012, Meyer 2015)." Referring to steep landscapes such as occur in the King Fire, the authors note that "Prescribed and managed fire has also been identified as the primary means to treat large landscapes particularly in areas where mechanical treatments are limited by access (North et al. 2012)." Since existing and future surface fuels are the primary contributor to fire behavior (Stephens et al. 2009), fire use is key to managing that component of the fuel profile. Managing these forests including Sierra Nevada dry mixed-conifer forests without active fuels management, "will maintain or even increase hazard over the coming decades" (Ibid). The repeated fire return scenario (median FRI 7-12 years, Safford 2013) for these landscapes requires repeated fire entries to maintain fuels treatment effectiveness, especially in the steep King Fire landscape.

Again referring to the Power Fire Ecological Framework (Estes and Gross 2015, p. 19) offer that, "Following large scale fires, an opportunity exists to define a landscape scale strategy to realign fire treatments with an area." These Region 5, Central Sierra Province Ecologists offer that the Forest Service should design a fireshed analysis that includes prescribed fire units based upon fire behavior modeling and expert opinion with 3 major objectives:

1. Reintroduction of fire on a short rotation interval to break up the continuity of post-fire fuels;
2. Maintenance of areas that burned at low and moderate severity within the pre-European fire return interval;

3. To facilitate prescribed fire in projects under previous decisions.

Also cited in the Power Fire Ecological Framework (p. 18), "Recent research has also shown that prescribed fire treatments either before or following plantation establishment can increase the likelihood of survival following a fire (Kobizar et al. 2009)."

None of these critical objectives were specifically called out in the purpose and need for action in the King DEIS. Restoration, recovery and resilience will remain unattainable without realignment of fire with this landscape. This need to "realign" fire treatments with the King Fire landscape is exactly the ecological direction needed to limit the next "mega-fire" and to get this landscape in a fire resilient condition.

Response: Prescribed fire use for future treatment of this landscape was explicitly addressed in the Fire Management Strategy within the King Fire (Appendix C) and is facilitated by treatments proposed under this project. However at this time it is expected that most areas that burned at high severity will not be ready for reintroduction of fire for the next 7 to 10 years and therefore it is unknown where treatments would occur. Other areas which burned at lower severity in the south end of the fire are being analyzed as part of the South Fork American River Cohesive Strategy. Because a specific proposal is not within the planning timeframe of this analysis it is expected that future NEPA documentation will be used to describe and analyze future burning within this landscape.

The Power Fire Ecological Framework was developed for a different purpose than the King Fire DEIS. The Power Fire framework was written to provide background for long term planning at the landscape level for restoring a resilient landscape and is meant to be used in concert with management objectives, and public participation to develop/inform future proposed actions. It is not a NEPA decision.

211. Comment (Commenter 21): There is no escaping this fact that in spite of all the reasons the Forest Service will offer, nothing will override the ecological realities associated with the lack of fire, fuels build-up and the inevitable susceptibility to another landscape fire event. Looking at the facts right in your backyard reveals a situation along the Highway 50 corridor of repeated (mostly human-caused) landscape fires (Wrights, Ice House, Cleveland, Fred's, Kyburz, and now King Fire)--all of which "blew-up" or nearly "blew-up" due to past management and a stunning lack of fire use. Managers are needed who take fire frequency and fire regimes ecology seriously as an ecosystem driver and as a tool that allows actions that give the Forest Service and stakeholders some say in the ecological outcomes on these public lands. Otherwise, as in the King and Rim Fires, high severity wildfire made the choices for us.

Response: Although it is true that much of the land, both public and private, has had various harvest prescriptions applied for decades, it is also true and important to understand that significant portions of the King Fire area had never been subject to any timber harvest, including the major canyons, such as the South Fork of the American River, Silver Creek and the Rubicon River Canyon. It is quite likely that the terrain, alignment and vegetation in these canyons played a significant role in terms of ultimate fire behavior both in previously harvested or unharvested timber stands.

In terms of general timber management within the burn area, outside of the major canyons, a variety of silvicultural prescriptions have been applied over the years, including several thousand acres of treatments designed and intended to change fuel profiles and reduce fire intensity. Many of these fuel treatments were successful in ameliorating fire behavior, but

unfortunately many were not, particularly during the several hours when the King Fire became a plume dominated fire, generating its own winds and traveled multiple miles in a very few hours from near Pollock Pines to Hellhole Reservoir.

Although, there were a variety of silvicultural treatments resulting in variable vegetation conditions on the ground, during the major fire run of the King Fire there was very little difference in terms of stand survivability, i.e. nearly all timber and other vegetation in the way of the fire front was killed. It is reasonable to surmise that in order to survive the fire, the timber stands in front of the fire would have needed to be much less dense than what is currently deemed to be desirable for those wildlife species that are dependent upon closed canopy, old growth stands. It is also quite likely that had there been large areas consisting of large, open-grown pine with a low density of smaller trees, greater stand survival would have been likely. To achieve such stand conditions on a large scale a combination of management actions including fire are needed. The King Fire Restoration Project is one element of the needed actions. Other actions including future prescribed fire use is described in the Fire Management Strategy within the King Fire.

212. Comment (Commenter 21): The Purpose and Need is wholly deficient under NEPA 40 CFR §1501.1 (d) by failing to identify significant issues for study early on in the process. The weight of all substantial evidence in this project fire record, the work completed in specialist's reports for the project, ecological reports requested by the Eldorado NF for other fire recovery areas, and the preponderance of scientific research in the Sierra Nevada for the past 20+ years cries out for Forest Service managers to take measures to restore fire aggressively and consistent with concepts for fire-landscape realignment.

We hope to see significant changes in the FEIS/ROD to address reintroduction of fire at the landscape scale as called out in recent scientific literature and the ecological framework to address fire restoration on the Eldorado National Forest.

Response: 40 CFR 1501.1 (d) states one of the purposes of Part 1501 (NEPA and Agency Procedures) as "Identifying at an early stage, significant environmental issues deserving of study and deemphasizing insignificant issues, narrowing the scope of the environmental impact statement accordingly."

The purpose and need is summarized on page xii and is described in detail on pages 4 to 5 of the FEIS. Per 40 CFR 1502.13 (Purpose and Need), "The statement shall briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action." The purpose and need and proposed action were distributed to the public, with a Notice of Intent (NOI) published on December 24, 2014 (DEIS, pgs. 6 to 7), early in the environmental analysis process. Comments from the public and other agencies were used to formulate issues concerning the proposed action, and significant issues were identified, as described in the FEIS on pgs. xiii to xiv and 7 to 8. These significant issues were used to develop three alternatives considered in detail that achieve the purpose and need differently than the proposed action. Six additional suggested alternatives were considered but eliminated from detailed study (see also response to comment 195 for the range of alternatives; response to comment 196 for addition of prescribed fire to all the action alternatives; and 198 [and the FEIS] for addition of a prescribed fire only alternative).

The purpose and need was developed consistent with 40 CFR 1502.13. Significant and non-significant issues were identified early in the process, following public scoping.

213. Comment (Commenter 21): Fire history, Fire Return Interval (FRI), and Fire as a Key Disturbance Process is Ignored in the Purpose and Need for action. Most of the King Fire area has had no fire history since 1908 (DEIS Appendix A, p. 9), with mean FRI of 11 years, or 9 fires in 100 years. In (Appendix C, p.1) former ENF fire staff member Brian Ebert stated plainly that, "Future management strategies need to address the use of fire as a viable fuels management tool (Agee and Skinner 2005; Stephens et al. 2009), a means to achieve large-scale prescribe burning and an important restoration treatment for many ecosystem processes stalled by the absence of frequent burning (North et al. 2012)."

In a recent Op Ed in the Sacramento Bee (7-4-14) titled, Fire is indispensable for healthy and productive forests, Regional Forester Randy Moore highlighted the role of fire in the forests of the Sierra Nevada by stating, "Fire is so important in the Sierra Nevada that it can be seen as medicine for ailing forests" (emphasis added).

Designing a restoration project of this scale and not including fire as a key, early and frequent component of forest management takes the purpose and need off the mark and fails to address the key problem (fire suppression and lack of fire) by trying to sweep this issue under the rug.

It is time for the Eldorado National Forest to "take your medicine" and design a purpose and need that will realign this landscape's fire frequency and fire behavior to be more consistent with NRV, insure resilience, limit dense plantations that thwart fire use and build the scientific integrity lacking in this current DEIS to be consistent with NEPA's requirements to insure professional and scientific integrity (40 CFR §1502.24).

40 CFR §1500.1 (b) requires that information be of high quality and have accurate scientific analysis, with expert agency comments and public scrutiny. NEPA documents should concentrate on the issues that are "truly significant" and not ignore input from scientists, agency experts, and the public regarding the lack of frequent fire in this King Fire area.

Ecological Integrity cannot be obtained by methods that ignore frequent reintroduction of fire. It is misleading to suggest to the public that the purpose and need will "facilitate restoration and resilience" (DEIS p. xiii) at any meaningful scale absent landscape level fire frequency realignment.

The long-term fuels strategy should be inclusive of fire and not suggest that treatment areas are solely designed to allow effective fire suppression. Under certain conditions, like those experienced on day four of the King fire, suppression may not be effective or possible. While fire suppression and State mandated homeowner fire clearance (PRC 4291-4299) plays a key role in protecting homes and communities, outside of the WUI, fire suppression and fire exclusion are significant barriers to implementing a large-scale fire and fuels management program to correct past management actions such as fire exclusion (USDA 2011, p. 2).

Response: As part of this strategy the King Fire Restoration project identified purpose and need element 2 for "Remove dead trees in strategic fire management areas to improve the agency's ability to manage and control future fires: Strategically located fire management areas facilitate the effective suppression and control of unwanted future fires and provide control lines for the application of future prescribed fires in the project area" and purpose and need element 3 "Actively manage severely burned areas to facilitate restoration and resilience".

Proposed salvage and fuel reduction treatments would reduce fuel load allowing for more effective fire suppression and increased ability for prescribed fire treatments in the future. Furthermore planting configuration and release treatments were designed to facilitate prescribed fire treatments in the near future (10-15 years) as described on Page 2-4 of the DEIS.

Prescribed fire use for future treatment of this landscape was explicitly addressed in the Fire Management Strategy within the King Fire (Appendix C) and is facilitated by treatments proposed under this project. However at this time it is expected that most areas that burned at high severity will not be ready for reintroduction of fire for the next 7 to 10 years and therefore it is unknown where treatments would occur. Other areas which burned at lower severity in the south end of the fire are being analyzed as part of the South Fork American River Cohesive Strategy. Because a specific proposal is not within the planning timeframe of this analysis it is expected that future NEPA documentation will be used to describe and analyze future burning within this landscape.

214. Comment (Commenter 21):
The forest should recognize the King Fire as an opportunity, both ecologically and economically, to reintroduce fire at a scale appropriate to the Sierra Nevada forests. North et al. (2012) highlights the pressing need to use fire to treat fuels at the landscape scale, stating:

> "With less than 20% of the Sierra Nevada's forested landscape receiving needed fuels treatments, and the need to frequently re-treat many areas, the current pattern and scale of fuels reduction is unlikely to ever significantly advance restoration efforts. One means of changing current practices is to concentrate large-scale fuels reduction efforts and then move treated areas out of fire suppression into fire maintenance. A fundamental change in the scale and objectives of fuels treatments is needed to emphasize treating entire firesheds and restoring ecosystem processes. As fuel loads increase, rural home construction expands, and budgets decline, delays in implementation will only make it more difficult to expand the use of managed fire. Without proactively addressing some of these conditions, the status quo will relegate many ecologically important areas (including sensitive species habitat) to continued degradation from either no fire or wildfire burning at high severity."

Response: The Responsible Official will consider your input. The Fire Management Strategy within the King Fire (Appendix C) provides long term guidance for locating strategic areas for fire suppression and fire management. It outlines a three prong approach to reintroducing prescribed fire on the landscape 1) reintroduction of fire on a short rotation interval to break up the continuity of post-fire fuels, 2) maintenance of areas that burned at low and moderate severity within the pre-European fire return interval, and 3) facilitate prescribed fire in projects under previous decisions.

215. Comment (Commenter 21): The majority of the King Fire area has seen little fire in the past century (DEIS 3-53). The yellow pine and dry mixed conifer forests within the King Fire supported frequent fire and display a pre-European fire return interval (FRI) of about 11 years. In other works, these forests evolved with a fire approximately every 9.1 years over the past century (Van de Water and Safford 2011). It is clear there is a need to increase the use of managed fire for multiple resource benefits. The most effective way to increase resiliency and the number of acres treated is to transition away from a suppression-dominated and reactionary fire policy and begin implementing a landscape-wide fuels management program that uses fire to mimic natural fire

regimes and allow the use of natural ignitions or "free-burning fires" to "regulate fire-induced effects across the landscape" (North et al. 2009). In other words, the best way to limit fire size and uncharacteristic fire effects is when fire burns into recent fire and eventually becomes self-regulating (Falk 2006; Stephenson 1999; Collins et al. 2009).

The Region 5-Sierra Forest Legacy Managed Fire MOU is a positive step in overcoming constraints to implementing a landscape-wide prescribed fire program. On national forests the first step to overcoming these constraints is to plan as though they will be overcome by including landscape plans, staffing and operational capacity necessary to do active burning. A large-scale prescribed fire program is the only option available to perpetually reduce fuels and reduce the economic impacts of mega fires as well as maintain ecological integrity across the landscape and ensure subsequent fires are more likely to burn less severely and within NRV. Consider the result of study on fire reburn severity in Yosemite National Park by van Wagtendonk et al. (2012):

> "Second and third fires reburned larger areas at high severity when the time between fires was nine years or greater, and nearly half of the original high severity areas reburned at high severity. The third and fourth fires did not burn at high severity when the return interval was less than nine years. These changes indicate that the effect of fuel reduction is offset by fuel accumulation over a nine-year period. Fuel accumulations and deposition rates determined by van Wagtendonk and Sydoriak (1987) and van Wagtendonk and Moore (2010) substantiate that nine years is sufficient time for fuels to recover to their pre-burn levels."

Based on the concept that historic fires limited fire size of current burns, there is an immediate need to return fire to the system within 5-10 years and any delays will have ecological consequences that affect the resiliency of the succeeding forest. The notion that the Forest Service "may contemplate future projects to address ecosystem restoration and resilience such as prescribed fire or additional fuels treatments" is not acceptable. Instead, developing an active (and early) fire restoration program for the King Fire landscape should be the very foundation of this proposed action.

Response: The Responsible Official will consider your input. The Fire Management Strategy within the King Fire identifies strategic areas for fire suppression and fire management within this landscape. It outlines a three prong approach to reintroducing prescribed fire on the landscape 1) reintroduction of fire on a short rotation interval to break up the continuity of post-fire fuels, 2) maintenance of areas that burned at low and moderate severity within the pre-European fire return interval, and 3) facilitate prescribed fire in projects under previous decisions. In this project, areas that are within the scope of the project as defined by the purpose and need were and which were within the timeframe for implementation with this project were considered for prescribed fire. Other areas which burned at lower severity in the south end of the fire are being analyzed as part of the South Fork American River Cohesive Strategy. Because a specific proposal is not within the planning timeframe of this analysis it is expected that future NEPA documentation will be used to describe and analyze future burning within this landscape.

216. Comment (Commenter 21): We have yet to see the agency begin to scale up the prescribed fire program and planning for such future projects will be time consuming, further delaying returning fire to the system. There is no reason that the EIS should not include the establishment and implementation of a landscape-wide long-term fuels management strategy that begins the process of returning fire to the landscape on a regular basis with the goal of fire-landscape realignment. It leads us to believe the ENF fire cadre and the Regional Ecology shop have not been consulted or their input was ignored, in your internal project development process. We ask

that the purpose and need be revised to include the need to restore low and mixed severity disturbance regimes to this landscape and that project activities include: (1) defining and prioritizing burn units based on proximity to communities and large-scale units that maximize the number of acres burned at the lowest cost; (2) defining fuel conditions that indicate burning is necessary and appropriate within burn units and within reforested areas; (3) natural and manmade fire breaks that will be used as unit boundaries; (4) the biotic and abiotic conditions under which each unit can and should be burned, including snag patches; and (5) the personnel required to implement the strategy based on the average annual number of burn days and fire frequency interval. The timeframe for restoration and recovery activities should be 50 years (5 FRIs) or more.

Response: After the King Fire, the ENF recognized a need to identify a strategy for managing activities within and adjacent to the footprint of the King Fire to assist with future fire management of planned and unplanned ignitions. The "Fire Management Strategy within the King Fire" (FEIS, Appendix C) provided a landscape strategy for planned and unplanned ignitions in the King Fire. As part of this strategy the King Fire Restoration project identified purpose and need element 2 for "Remove dead trees in strategic fire management areas to improve the agency's ability to manage and control future fires: Strategically located fire management areas facilitate the effective suppression and control of unwanted future fires and provide control lines for the application of future prescribed fires in the project area" and purpose and need element 3 "Actively manage severely burned areas to facilitate restoration and resilience".

The proposed reforestation and release treatments favor the rapid development of fire resistant stand structures and allow for the rapid reintroduction of fire into the burned landscape at various scales. Furthermore planting configuration and release treatments were designed to facilitate prescribed fire treatments in the near future (10-15 years) as described on page11 of the FEIS.

As identified by the commenter, the Eldorado National Forest has had several prescribed fire projects analyzed and waiting for implementation including the Peavine Point RNA prescribed burn and a prescribed burn in the Rubicon Canyon. We agree that prescribed fire is an important and critical tool in forest management, however due to limitations in implementation of prescribed fire, as illustrated by the Peavine Point RNA burn, relying on only prescribed fire to achieve management objectives following the King Fire would not result in meeting the purpose and need for the project. The project proposal is designed to facilitate future prescribed fire use while also allowing for other treatments to restore and maintain forests in this landscape.

Reforestation

217. Comment (Commenter 21): Proposed planting densities are much too high and are not ecologically supportable. It is often proposed that reforestation is necessary to reach fully-stocked desired future conditions sooner than without active reforestation. However, industrial plantation forestry, similar to what is being proposed in the DEIS (i.e., as many as 300 trees per acre are included in planting designs within the DEIS) does not result in multi-aged and multi-canopied forest conditions.

Response: The Responsible Official will consider your input. This project is using the latest research and contemporary practices in managing for desired future condition, developing the purpose and need, and developing the proposed action, which included the intent to restore conifer forests in areas that are ecologically sustainable and can be managed to have a high

probability of surviving subsequent wildfire (FEIS page 5). For example, the "guiding principles for reforestation" on FEIS page 11 described designing "planting and follow-up treatments to create an individual, clump, and opening pattern described for low-intensity, frequent fire forests." It also described varying "planting pattern, species composition, and density based on topography, land allocation, and site class." Proposed planting densities were identified based on values for differing landscape positions in a fire-active forest described in Lydersen and North (2012) along with some initial mortality and the 4 to 15% long-term mortality based on active-fire, old-growth forest mortality rates described in GTR 237 (DEIS, p. 16). In the proposed action, stands where reforestation units include lower slopes identified for planting a range of 60-100 clusters which amounts to 180 to 300 trees per acre with a maximum of 300 trees per acre. This particular slope position includes approximately 915 acres or 8 percent of the area being reforested. Literature indicates that lower slopes, particularly mesic sites, are capable of supporting higher tree densities (Underwood et al. 2010, Lyderson and North 2013), which is reflected in our initial planting densities and the desired future condition (FEIS Table 2.6, pg. 16). The remaining landscape (92%) will be planted at densities either allocated for middle slopes (100-160 tpa) or upper slopes (100-120 tpa) arranged in cluster plantings or as identified for Strategic fire management areas (60-100 trees per acre) (FEIS Table 2.6, pg. 16). These areas would have supported much lower densities of trees in a frequent fire regime.

In comparison, planting densities in past projects have ranged between 250 to greater than 400 trees per acre typically planted in an even spaced design and often not have taken into account variability in topographic position. The alternatives analyze for a much lower density which would vary across the proposed treatment area in the King Fire.

218. Comment (Commenter 21): The DEIS provides no evidence to support the statements that reforestation densities proposed in the DEIS will result in spotted owl habitat faster than natural forest succession. NEPA requires evidence to support conclusions (40 CFR §1502.24).

Response: The vegetation analysis in Chapter 3 shows that the stands will develop into larger, more fire resistant trees in a quicker timeframe with proposed treatments, however there is no analysis or statement in the FEIS that reforestation treatments are designed to result in faster development of California spotted owl habitat. Reforestation and release treatments are designed to restore and maintain forest stands in areas where a future conifer forest is a desirable condition as identified in the King Fire Vegetation Resilience and Restoration Assessment (Appendix B).

219. Comment (Commenter 21): For ecological reasons, we do not support the exorbitantly high levels of intensive reforestation included in any of the action alternatives. Although we are opposed to the high planting densities and high levels of herbicide use proposed in the action alternatives, we are not categorically opposed to reforestation. We do support reforestation methods that attempt to maximize ecological integrity.

To us, it is unnecessary to spend millions of dollars to create fire-prone even-aged forest plantations at the expense of ecological integrity and species viability in order to reach fully stocked forest conditions a few decades sooner.

Rather than homogenizing the forest by planting a carpet of trees across the landscape and using herbicide to kill most anything that gets in the way of tree vigor, we believe reforestation should attempt to mimic naturally regenerating high severity burned forests that burn within NRV. One

of the primary drivers of the perception that active reforestation is necessary in areas that burn at high severity and outside of NRV is distance to seed source.

This idea (above) is supported in the Forest Service Region 5 Ecological Restoration Leadership Intent (p.3) which states, "Ensure vegetation and fire management efforts are grounded in concern for biodiversity and ecological process both before and after disturbances like fire."

Response: The Responsible Official will consider your input.

Initial planting densities proposed were identified based on values for differing landscape positions in a fire-active forest described in Lydersen and North 2012 along with some initial mortality and the 4 to 15% long-term mortality based on active-fire, old-growth forest mortality rates in GTR 237 (FEIS, pg. 16). In the proposed action, stands where reforestation units include lower slopes identified for planting a range of 60-100 clusters which amounts to 180 to 300 trees per acre with a maximum of 300 trees per acre. This particular slope position includes approximately 915 acres or 8 percent of the area being reforested. It is widely acknowledged in the literature that lower slopes particularly mesic sites are capable of supporting higher tree densities (Underwood et al. 2010, Lyderson and North 2013), which is reflected in our initial planting densities and the desired future condition (Table 2.6, p. 16 FEIS).

Resilience, restoration, fuels, wildfire and natural range of variability were reviewed specifically for this project (FEIS Vol. 2 Appendix A, B, and C), which informed planning of recovery, reforestation, and restoration activities within the area (FEIS Vol. 2 Appendix B page 2). The intent was to use the resilience and restoration analysis in conjunction with the Appendix C's Fire Management Strategy within the King Fire, as well as management objectives for other forest resources, and public participation to develop proposed actions and alternatives. The FEIS also reviewed the best available science regarding post fire management

Approximately 40 percent of the acres of conifer forest type on National Forest System lands that burned with greater than 90 percent basal area mortality within the project area are in treatment units that would have reforestation and release activities with Alternatives 2 and 5 and approximately 51 percent would have reforestation and release treatments with Alternative 4 . In addition to the large areas of the landscape not being treated with any of these alternatives, a mixture of retention of snags and early seral habitat is provided through these alternatives. Swanson et al. 2011 suggests that "maintenance of areas of naturally developing early successional forest ecosystems as part of a diverse landscape… should be '*in reasonable proportion to historical occurrences of different successional stages' as based on region-specific historical ecology*". Early seral post-fire habitats are just one component of a complex temporal landscape. Recent research has documented the importance of within and between stand heterogeneity that represents all seral stages and maximizes the presence of numerous species (White et al. 2013). Late successional habitats dominated by conifer trees are also an important successional stage. This seral stage evolved with low to moderate intensity fire and has a limited capacity to recover after stand replacing events due to limited natural regeneration and extensive shrub cover (Collins and Roller 2013). As a result, once conifer forests may be converting to new vegetation assemblages following high severity fire (Perry et al. 2011). As described in the analysis in Chapter 3 of the FEIS on pages 208 to 211, the use of herbicide decreases the time to develop key structures such as large trees within forest stands.

The FEIS also analyzes the increase of both native and non-native grass and forbs with the use of herbicides as proposed in the project.

"*Over the short term, plant abundance may be affected by herbicide treatments, but no plant species would be expected to be eliminated from release treatments. Sites with reduced shrubs may have increased plant diversity and species richness compared to stands that are left untreated or only radially released. Battles et al. (2001) found that at the Blodgett Research Station in Georgetown, California, understory species richness was significantly greater in managed plantations than in less intensive treatment types. In mixed forests in Canada, Sutton (1993) found no detectable effect on species composition 10 years after herbicide treatments. DiTomaso et al. (1997) in northern California found no long-term detrimental effect on vegetative cover or species evenness with herbicide use. They also found that, in areas without herbicide treatment, biodiversity and, to a lesser extent, species evenness had not recovered after 14 years, in contrast with herbicide treated areas*" (FEIS, pp. 208-209).

220. Comment (Commenter 21): It is important to begin any discussion on CESF with the definition of CESF, and most forest ecologists would agree with the basic principles that CESF is a seral stage in forest development that results when a natural disturbance agent resets successional pathways and the forest is allowed to maintain the full array of legacies (i.e., not subject to post-fire logging or native vegetation control activities) and experience natural regeneration (i.e., not seeded or planted); CESF may be classified as such until trees become pole sized (greater than 6 inches dbh). CESF is among the scarcest habitat condition in many regions (Lindenmayer and Franklin 2002, Noss et al 2006). Compared to logged areas, CESFs are structurally more complex, contain more large trees and snags that originated from the pre-disturbed forest, have more diverse understories, functional ecosystem processes, and more diverse gene pools that, theoretically, should provide greater resilience in the face of climate change than that provided by the simplified early seral forests produced by logging (Thompson et al 2009, DellaSalla et al. 2013). Despite these ecological values, the U.S. Forest Service often determines that the economic value far exceeds the ecological value of CESF. This is clearly illustrated by defining forests that burn at high and moderate severities to be "deforested" and in need of immediate salvage and replanting to recoup the economic value of the timber and to minimize the length of time required for a site to reach old forest conditions. Based on past Forest Service reforestation efforts, there is little to no evidence that intensely reforested and ecologically depauperate areas will survive to reach mature forest conditions (40 CFR§1502.24). Please demonstrate that this re-occurring theme has actually happened in the Sierra Nevada. "In many areas throughout western North America, uncharacteristic stand-replacement wildfires have been followed by reforestation programs that recreate the dense young forests, providing the potential for yet another stand-replacement fires" (Franklin and Agee 2003).

Complex early seral conditions should be supported as a valuable stage of biodiversity and forest evolution, critical to supporting ecological integrity and affirming Forest Service ecological integrity guidance. Plantation establishment and management are counter to supporting ecological integrity and will likely reduce the ability of the forest to respond to climate change with resiliency. The 2012 Forest Planning Rule explicitly spells out the definition for ecological integrity: "The quality or condition of an ecosystem when its dominant ecological characteristics (for example, composition, structure, function, connectivity and species composition and diversity) occur within the natural range of variation and can withstand and recover from most perturbations imposed by natural environmental dynamics or human influence" (36 CFR § 219.19).

Response: FEIS page 5 describes one of the project purposes is to "[B]alance active management with the retention of important attributes of post-fire habitat at the landscape scale

and within treatment areas to support the diversity and abundance of species". This purpose and need statement discusses the value and components of complex early-seral forest and also providing complex early-seral forest while not generating excess future fuels, jeopardize survival of planted trees, and safety of workers.

Resilience, restoration, fuels, wildfire and natural range of variability were reviewed specifically for this project (FEIS Vol. 2 Appendix A, B, and C), which informed planning of recovery, reforestation, and restoration activities within the area (FEIS Vol. 2 Appendix B page 2). Specific aspects of the action alternatives were intended to simulate NRA and to provide diversity. An example of relevant actions include specific areas not proposed for treatment within high severity patches retained to provide shrubs and other herbaceous cover types (FEIS page 10), reforestation with varying planting pattern, species composition, and density to allow for development of a heterogeneous individual, opening, and clumped patterns given future predicted mortality and intermediate treatments including prescribed fire (FEIS page 11), and snag retention patches (FEIS page 14).

Early seral habitat is a successional stage that is initiated after stand replacing events. Recently burned forests can have dense patches of snags, abundant downed logs, montane chaparral patches and highly variable natural conifer regeneration (Swanson et al. 2010). Snags are created whenever a live tree dies from a mortality agent such as insects, disease or physical injury, including wind throw and fire. These components provide critical structures necessary to benefit many early seral species (Swanson et al. 2010, Collins and Roller 2013, White et al. 2013). However, early seral post-fire habitats are just one component of a complex temporal landscape. In the Ecological Analysis – Comparison to Natural Range of Variability paper prepared for the project, it was found that early-seral conditions were in greater amounts compared to NRV (FEIS Appendix A page 2).

Recent research has documented the importance of within and between stand heterogeneity that represents all seral stages and maximizes the presence of numerous species (White et al. 2013). Late successional habitats dominated by conifer trees are also an important successional stage. This seral stage evolved with low to moderate intensity fire and has a limited capacity to recover after stand replacing events due to limited natural regeneration and extensive shrub cover (Collins and Roller 2013). As a result, once conifer forests may be converting to new vegetation assemblages following high severity fire (Perry et al. 2011) (see also FEIS page 208). The response from DellaSalla et al. (2013) to Franklin and Johnson (2012) provides guidance on the maintenance of early seral conditions in the Pacific Northwest and it is recognized that these principles certainly help to guide management of complex early seral forests in the Sierra Nevada.

Early seral conditions are important, but not rare in the Sierra Nevada landscape. Assessment of shrub cover in the Sierra Nevada landscapes suggest that the overall portion of the yellow pine mixed conifer landscape occupied by shrubs today is broadly similar to, but possibly lower than the portion occupied at the beginning of the 20th century (Safford 2013). Historical accounts from Leiberg (1902) reported that chaparral covered only 5.7 percent of the area mapped (large portions of the Plumas and Tahoe NFs, and very small pieces of the Lassen, Eldorado and Lake Tahoe Basin MU). Additionally, based upon early 20th century forest surveys (i.e. the 1910-1912 Stanislaus timber survey cited by Center for Biological Diversity/John Muir Project) Show and Kotok (1924) estimated that chaparral covered only 1 percent of six National Forests (Lassen, Plumas, Tahoe, Eldorado, Stanislaus, and Sierra; Table 19, pg. 41) in the Sierra Nevada at the beginning of the 20th century. Modelling the historic presence of early seral conditions on a landscape that was characterized by 7 percent high severity fire showed that 20% would have been in the early successional stage (Miller, personal communication).

Historic reports and models do not indicate that early seral conditions are rare in current conditions.

In fact, under the current and predicted climate scenarios early seral conditions will continue to increase on the landscape (Lenihan et al. 2008, Cole 2010). Miller et al. (2009) and Miller and Safford (2012) found "broad-scale, quantitative demonstration that the extent of forest stand replacing fire is increasing across a significant part of the western US." This increase is driven by greatly homogenized forests with higher canopy cover and dense trees that have the ability to burn in stand replacing events transitioning them to early seral conditions. Mallek et al. (2013) found that current rates of high severity fire in yellow pine and mixed conifer forests, which constituted much of the Rim Fire area on the Stanislaus NF, are similar to probable presettlement rates of high severity fire. In other words, in these forest types there does not seem to be a deficit of early seral habitat caused by fire. Future model predictions suggest increased transition of forest to chaparral and grassland being driven by increased fire activity (Lenihan et al. 2008).

The 2004 FSEIS ROD provides management guidelines for disturbance events such as wildfires including recovering the economic value of timber killed or injured by the "disturbance" (wildfire), re-establishing forested conditions and managing the development of fuel profiles over time. These guidelines include the recommendation to "…generally …not conduct salvage harvest in at least 10 percent of the total area affected by fire." (USDA 2004, pg. 52). The Forest Service recognizes the importance of the CESF and therefore as described in the DEIS: "Maintaining multi-structure early-seral conditions is important across the King Fire area for: 1) supporting wildlife that require post-fire snags and shrubs, 2) breaking up the continuity of adjacent seral stages, and 3) allowing natural succession to proceed: (FEIS, Appendix A, p. 11). All alternatives propose to maintain 14-17% of CESF (FEIS, Appendix A, p. 10).

221. Comment (Commenter 21): Due to past Forest Service management activities (even-aged management and high-grading) and ongoing even-aged management on private industrial timber lands, there has been a distinct loss of ecological integrity on and adjacent to the King Fire landscape. The King Fire Proposed Action should start the journey to ecological integrity by establishing the process, structure, function, composition and connectivity required for a healthy ecosystem. It is time to abandon the old PLANT-SPRAY (and) PRAY way of doing business.

Response: As stated in the FEIS on page 2 "*Restoration efforts need to balance short- and long-term risk and objectives to achieve ecological integrity, which is the quality or condition of an ecosystem's dominant ecological characteristics to occur within the natural range of variation and withstand and recover from most natural or human perturbations….The percentage of high-severity fire and the high-severity patch sizes in the King Fire far exceed the natural range of variability.*" One of the objectives for this project is to maintain the ecological integrity of post-fire habitat (FEIS, pg. 2). Activities were identified considering the natural range of variability for mixed conifer forests, historical/climate vegetation data, the probability of natural regeneration, strategic fire areas and guiding principles for reforestation analyzed in the King Fire Vegetation Resilience and Restoration Assessment (FEIS, Appendix B).

The proposed reforestation and release treatments favor the rapid development of fire resistant stand structures and allow for the rapid reintroduction of fire into the burned landscape at various scales. Additionally, planting configuration and release treatments were designed to facilitate prescribed fire treatments in the near future (10-15 years) as described on pages 11 of the FEIS. Planting strategies are also designed to maintain ecological integrity while balancing future climate projections, economics, long-term management feasibility, and desired conditions (FEIS pg. 15).

It is through the mixture of proposed activities and areas maintained as CESF the Forest Service believes that the ecological integrity of this landscape will be maintained and enhanced with this project.

222. Comment (Commenter 21): Natural succession is an ecological process that often begins with fire, and proceeds through multiple stages of forest development, in various degrees throughout the forest depending on fire severity and pre-existing forest composition (Franklin et al 2002). Disruption of this natural process through salvage logging and planting interrupts the natural successional process, and results in reduced biodiversity (Lindenmayer, Burton and Franklin 2008). The cumulative effect (suggested below) that the proposed action would produce must be addressed in the EIS:

> "Habitats and environmental resources appear to be relatively limited in a fully stocked young forest (Spies and Franklin 1991). As a result, species diversity, as well as structural and functional diversity, is probably lowest in this stage of forest development" (Franklin and Spies 1991)

In order to preserve natural ecological processes and biodiversity, many leading forest ecologists today emphasize the importance of naturally evolving early successional forests, noting that they are now the rarest type of forest today:

> "Currently, early-successional forests (naturally disturbed areas with a full array of legacies, i.e. not subject to post-fire logging) and forests experiencing natural regeneration (i.e. not seeded or planted), are among the most scarce habitat conditions in many regions" (Noss et al 2006).

> "Young forests growing within a matrix of unsalvaged snags and logs may be the most depleted forest habitat type in regional landscapes, particularly at low elevations (Lindenmayer and Franklin 2002)" (in Brown, Agee, and Franklin 2004).

> "Alpha (species) diversity of both plants and animals is often highest early in succession before tree-canopy closure occurs, lowest in the heavily shaded young forest, and recovers to intermediate as the forest matures and evolves into old growth" (Franklin and Spies 1991).

> "While scientific and management focus has been on the structural complexity of large-stature forests and the habitat relationships of associated organisms, an emerging body of literature shows that a similar or even greater number of species such as songbirds and butterflies are closely associated with the structural and compositional features of small-stature pre-forest vegetation (Betts et al. 2010)" (in Donato et al. 2012).

> "Traditional intensive forest management encouraging prompt reforestation and few legacies is unlikely to approximate the role of naturally generated early-seral conditions" and "Our research, while exploratory in nature, suggests that complex early-seral communities have importance on par with complex late-seral forests in providing habitat for conservation-listed species." (Swanson et al. 2014).

Swanson et al. (2011) recommend avoiding the certain activities in post-fire proposals: "Natural disturbance events will provide major opportunities for these ecosystems, and managers can build on those opportunities by avoiding actions that (1) eliminate biological legacies, (2) shorten the

duration of the ESFEs, and (3) interfere with stand-development processes. Such activities include intensive post-disturbance logging, aggressive reforestation, and elimination of native plants with herbicides."

> "Areas devoted to intensive timber production generally provide little high-quality early seral habitat for several reasons. First, few or no structures from the preharvest stand (e.g., live trees, snags, and logs) are retained on intensively managed sites but are abundant after severe natural disturbances" and "Intensive site preparation and reforestation efforts limit both the diversity and the duration of early seral organisms, which may also be actively eliminated by use of herbicides or other treatments" (Swanson et al. 2011).
>
> "Consequently, many national forest landscapes currently lack sufficient representation of high-quality early seral ecosystems because of harvest, reforestation, and fire suppression policies on both private and public lands (Spies et al. 2007, Swanson et al. 2011)" (in Franklin and Johnson 2012).
>
> "The need to pay more attention to biodiversity issues in plantation design and management is supported by observational, experimental, and theoretical studies that indicate that biodiversity can improve ecosystem functioning, i.e., it is not just the importance of biodiversity per se but its role in improving the overall resilience of the new ecosystem" (Carnus 2006).
>
> "A cautious approach is to increase habitat that is currently rare, or underrepresented compared to active-fire forest conditions, avoid creating forest conditions that do not have a historical analog, and emulate the spatial heterogeneity of forest conditions that would have been created by topography's influence on fire frequency and intensity" (North 2012).

In summary, post-fire activities that include mastication, seeding, replanting, and herbicides will not improve ecosystem integrity or resiliency in the King Fire region, and may do more harm than good. Restoring non-conifer key components and processes of these ecosystems is essential for full recovery of the habitats and food web dynamics across trophic levels, and restoration of the characteristic fire regime.

Response: Early seral habitat is a successional stage that is initiated after stand replacing events. Recently burned forests can have dense patches of snags, abundant downed logs, montane chaparral patches and highly variable natural conifer regeneration (Swanson et al. 2010). Snags are created whenever a live tree dies from a mortality agent such as insects, disease or physical injury, including wind throw and fire. These components provide critical structures necessary to benefit many early seral species (Swanson et al. 2010, Collins and Roller 2013, White et al. 2013).

However, early seral post-fire habitats are just one component of a complex temporal landscape. Recent research has documented the importance of within and between stand heterogeneity that represents all seral stages and maximizes the presence of numerous species (White et al. 2013). Late successional habitats dominated by conifer trees are also an important successional stage. This seral stage evolved with low to moderate intensity fire and has a limited capacity to recover after stand replacing events due to limited natural regeneration and extensive shrub cover (Collins and Roller 2013). As a result, once conifer forests may be converting to new vegetation assemblages following high severity fire (Perry et al. 2011).

Carnus et al. (2006) indicated that there is no single or simple answer to the question of whether planted forests are "good" or "bad" for biodiversity. Plantations can have either positive or

negative impacts on biodiversity at the tree, stand, or landscape level depending on the ecological context in which they are found.

Early seral conditions are important, but not rare in the Sierra Nevada landscape. Assessment of shrub cover in the Sierra Nevada landscapes suggest that the overall portion of the yellow pine mixed conifer landscape occupied by shrubs today is broadly similar to, but possibly lower than the portion occupied at the beginning of the 20th century (Safford 2013). Historical accounts from Leiberg (1902) reported that chaparral covered only 5.7 percent of the area mapped (large portions of the Plumas and Tahoe NFs, and very small pieces of the Lassen, Eldorado and Lake Tahoe Basin MU). Additionally, based upon early 20th century forest surveys (i.e. the 1910-1912 Stanislaus timber survey cited by Center for Biological Diversity/John Muir Project) Show and Kotok (1924) estimated that chaparral covered only 1 percent of six National Forests (Lassen, Plumas, Tahoe, Eldorado, Stanislaus, and Sierra; Table 19, pg. 41) in the Sierra Nevada at the beginning of the 20th century. Modelling the historic presence of early seral conditions on a landscape that was characterized by 7 percent high severity fire showed that 20% would have been in the early successional stage (Miller, personal communication). Historic reports and models do not indicate that early seral conditions are rare in current conditions.

In fact, under the current and predicted climate scenarios early seral conditions will continue to increase on the landscape (Lenihan et al. 2008, Cole 2010). Miller et al. (2009) and Miller and Safford (2012) found "broad-scale, quantitative demonstration that the extent of forest stand replacing fire is increasing across a significant part of the western US." This increase is driven by greatly homogenized forests with higher canopy cover and dense trees that have the ability to burn in stand replacing events transitioning them to early seral conditions. Mallek et al. (2013) found that current rates of high severity fire in yellow pine and mixed conifer forests, which constituted much of the Rim Fire area on the Stanislaus NF, are similar to probable presettlement rates of high severity fire. In other words, in these forest types there does not seem to be a deficit of early seral habitat caused by fire. Future model predictions suggest increased transition of forest to chaparral and grassland being driven by increased fire activity (Lenihan et al. 2008).

The 2004 FSEIS ROD provides management guidelines for disturbance events such as wildfires including recovering the economic value of timber killed or injured by the "disturbance" (wildfire), re-establishing forested conditions and managing the development of fuel profiles over time. These guidelines include the recommendation to "…generally …not conduct salvage harvest in at least 10 percent of the total area affected by fire." (USDA 2004, pg. 52). The Forest Service recognizes the importance of the CESF. "Maintaining multi-structure early-seral conditions is important across the King Fire area for: 1) supporting wildlife that require post-fire snags and shrubs, 2) breaking up the continuity of adjacent seral stages, and 3) allowing natural succession to proceed: (FEIS, Appendix A, p. 11). All alternatives propose to maintain 14-17% of CESF (FEIS, Appendix A, p. 10).

223. Comment (Commenter 21): The Forest Service must move into a new paradigm that includes clumped "cluster" planting in a spatial arrangement supporting resilience, managed for rapid fire-landscape realignment with existing fire regimes and frequencies. By rapid fire return we mean within the 5-10 year scope of this EIS.

Response: The proposed reforestation treatments use a clumped "cluster" planting design as described on pages 15 to 17 of the FEIS. The reforestation and release treatments proposed favor the rapid development of fire resistant stand structures and allow for the rapid reintroduction of fire into the burned landscape at various scales. Furthermore planting

configuration and release treatments were designed to facilitate prescribed fire treatments in the near future (10-15 years) as described on page 11 of the FEIS.

224. Comment (Commenter 21): We believe reforestation should attempt to mimic naturally regenerating forests that burn at high severity but within NRV. One of the primary drivers of the management perception that active reforestation is necessary in areas that burn at high severity and outside of NRV is the distance to seed source. Therefore, it only makes sense that the primary purpose of reforestation activities would be to provide a seed source of an appropriate species mix and to use NRV to guide future management decisions.

To better mimic naturally recovering high severity burned forests that burned within NRV, we suggest the following principals be used to guide the reforestation strategy:

(1) Planting small reforestation patches ("clusters") within much larger unplanted stands for the purpose of providing a seed source.
(2) The distance between planted patches would be based on half the seed dispersal distance of the planted trees.
(3) Planted areas (tree clusters and surrounding protection zone) would be intensively managed to ensure tree survival.
(4) Patches would only be planted in areas beyond seed dispersal distance of green forest.
(5) Planting would be limited to sites that a forest is likely to persist into the future based on climate change models.
(6) Use of PSW-GTR-220 principles would include consideration of slope, aspect and topographic position. Site-specific conditions such a cold-pool pockets, moist areas and north aspect would be favored due to higher moisture retention (GTR-220, pgs. 18-21).
(7) Managed fire would be used as the primary management tool reduce fuel accumulations and create heterogeneity.
(8) The successive planting strategies will be directly coordinated with fire ecologists and fuels staff to insure that planting does not impinge on frequent fire return.

We understand such as strategy would require waiting until the planted trees become seed-bearing to reach desired future ecological/stocking levels that include active fire, but our strategy: (1) does not compromise the ecological integrity of complex early seral forests nearly to the extent that the traditional industrial reforestation methods do; (2) would provide for a heterogeneous multi-aged forest; (3) would significantly decrease the time required to reach desired conditions, compared to the no action alternative; (4) if herbicides were proposed (which we do not support), would drastically reduce the use of herbicides across the landscape; and (5) significantly reduce the costs associated with reforestation due to the smaller scale.

The goal in the above strategy would be to: 1) protect the tree clusters to get them to seed-tree stage, 2) not do anything that would interfere with active fire return, and 3) allow active fire and older tree clusters to determine (with the help of an engaged fire and forestry cadre) what the future forest conditions evolve into during climate, forest, weather, topography interactions in the future.

Response: An alternative which would only reforest areas through creation of small founder stands consistent with the commenters request was developed for the FEIS.

Swanson et al. 2011 suggests that "maintenance of areas of naturally developing early successional forest ecosystems as part of a diverse landscape… should be 'in reasonable proportion to historical occurrences of different successional stages' as based on region-specific

historical ecology." The National Forest Management Act (NFMA) sets policy to maintain appropriate forest cover in accordance with forest management. Planting trees is a way to ensure this policy is met in areas where seed sources are lacking, and ensuring a diverse multi-species forest becomes established in a timely manner. The King Fire Vegetation Resilience and Restoration Assessment (Appendix B of the FEIS) identified where reforestation was an appropriate management action. Conifer seeds are not naturally dispersed long distances so conifer tree planting would ensure a variety of native conifer tree seedlings would be re-established in severely burned areas. Replanting severely burned areas with ecologically appropriate species would ensure timely replacement of burned conifer forest stands and improve tree species composition. The intent for planting trees is guided by these policies and the goals of moving the burned landscape toward desired conditions in the Forest Plan.

In order to restore portions of the forest to a mature conifer forest, initial planting densities proposed in the King Fire Restoration Project were identified based on values for differing landscape positions in a fire-active forest described in Lydersen and North 2012 along with some initial mortality and the 4 to 15% long-term mortality based on active-fire, old-growth forest mortality rate from Chapter 2 in GTR 237 (FEIS, pg. 16). In the proposed action, stands where reforestation units include lower slopes identified for planting a range of 60-100 clusters which amounts to 180 to 300 trees per acre with a maximum of 300 trees per acre (FEIS, pg. 16). This particular slope position includes approximately 915 acres or 8 percent of the area being reforested. It is widely acknowledged in the literature that lower slopes particularly mesic sites are capable of supporting higher tree densities (Underwood et al. 2010, Lyderson and North 2013). The remaining landscape (92%) is proposed to be planted at densities either allocated for middle slopes (100-160 tpa) or upper slopes (100-120 tpa) arranged in cluster plantings or at lower densities (60-100 tpa) within Strategically Placed Fire Management Zones (Table 2.6, pg. 16 FEIS). These are areas which would have supported much lower densities of trees in a frequent fire regime.

225. Comment (Commenter 21): Planting Strategy is "Business as Usual" and will not Provide Variability or Heterogeneity at Meaningful Scales.

"A certified silviculturist can approve (alternative) stocking levels based on a site specific prescription." 1991 FSH 2409.26b Reforestation Handbook, 4.11a.

It is not mandatory to meet specific stocking levels if the intention is to improve resilience, restore natural ecological process or respond to new ideas such as PSW-GTR-220 and the implications of topographic influences on sustainable tree densities in an active fire regime. The use of GTR-220/237 heterogeneity principles such as planting in moister areas or cold pool pockets to aid tree survival (PSW-GTR-220, p. 17) is another important concept not considered in the 1991 FSH Reforestation Handbook. The other concern we have regarding the "appropriate stocking densities" is that this Forest Service Handbook is seriously outdated and fails to recognize the recent positive changes in forest management including: concepts of ecological integrity, sustainability, wildlife viability, complex early seral forests, fire return interval, etc., that evolved since the unfortunate days of old-growth high-grading and large scale clear-cutting which ended in 1993 thanks solely to the new protections for the California Spotted owl instituted by the Forest Service-PSW Regional Office. Uniform stocking densities and dense tree spacing is a hold-over from the plantation forestry days when the Forest Service was focused heavily on wood fiber production at the expense of ecological integrity.

Response: The issue identified by the commenter seems to be with the stocking suggestions in the handbook.

Guiding principles of reforestation in the King Fire Restoration Project described on page 11 of the FEIS are to:

- "Accelerate the development of large trees including a high percentage (>50%) of fire-tolerant pines;
- Design planting and follow-up treatments to create an individual, clump, and opening pattern described for low-intensity, frequent fire forests (Larson and Churchill 2008, Larson and Churchill 2012, Churchill et al. 2013);
- Planting would be done to establish a future tree density which would be consistent with historic forest conditions that may be more resilient to drought and low to moderate fire intensities;
- Vary planting pattern, species composition, and density based on topography, land allocation, and site class;
- The cluster planting and initial stocking density is designed so that sufficient seedlings are planted to capture microsites within the units and allow for development of a heterogeneous individual, opening, and clumped pattern given future predicted mortality and intermediate treatments including prescribed fire;
- Favor rapid development of fire-resistant stand structure (encourage crown rescission and separation of shrub cover and tree foliage) so that use or occurrence of fire within this landscape results in acceptable survival of plantation stands within a 15-year timeframe;
- Prioritize planting areas furthest from live-tree seed sources and productive sites with potential lower fire intensities (i.e., moist, flatter, and cool-air microsites)"

As a part of achieving this guiding principal, unit specific reforestation prescriptions were developed using the landscape and management zone proposed planting densities on pages 15 to 17 of the FEIS. Alternative stocking prescriptions from those identified in FSH 2409.26b were approved by the certified silviculturist on the project as directed in the Forest Service Handbook. The proposed number of trees per acre by landscape position are summarized below.

Trees per acre and Reforestation Strategy by Zone	Percent of acres	Sum of acres
80-120 (Upper Slope)	1.6%	184
80-160 (Mid and Upper Slope)	35.6%	4046
100-300 (Upper to Lower Slope)	8.0%	908
180-300 (Lower Slope)	0.1%	7
60-100 (Strategic Fire Management Zone and WUI)	54.7%	6225
Grand Total	100.0%	11370

226. Comment (Commenter 21): How do you judge fire resilience and reforestation success?

The Forest Service needs to explain the methods and metrics for judging success as you appear to be replicating the very same reforested conditions (dense planting and fire exclusion) that have led to recent fire events on the ENF. These are economically and ecologically costly events that strain our ecological, social and economic capacity to cope with landscape high severity fire events. Repeating the same strategy and expecting a different result is . . . hard to defend. See (below) the photo collage of previous failed plantation efforts on the Eldorado National Forest directly adjacent to the King Fire and the Highway 50 corridor.

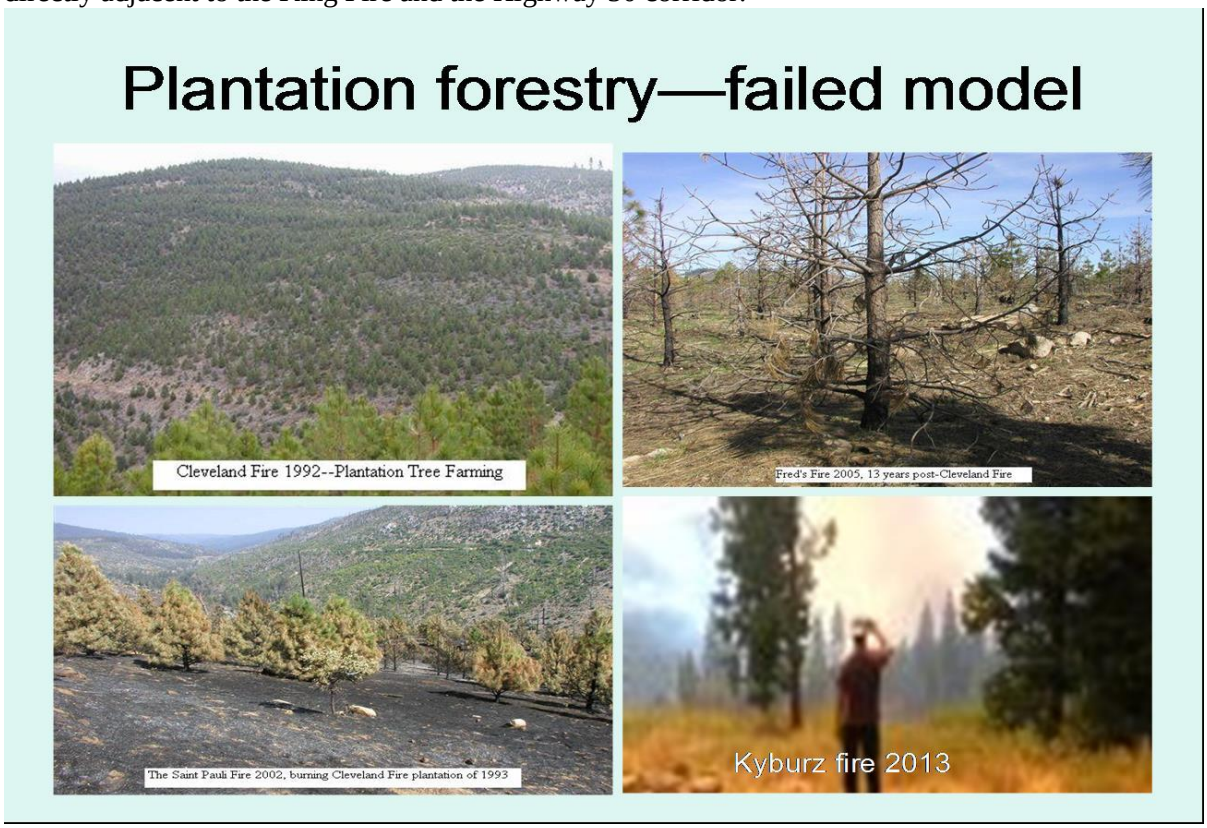


Image above: Plantations on the Eldorado National Forest

The DEIS strategy for heterogeneity is a passive approach that is poorly defined and lacks an active effort to create variability and resilience in an active, frequent fire regime.

Dense planting techniques, historically left untended until the first commercial harvest, are not the equivalent of a scientifically sound tree-cluster distribution strategy that actually supports fire use versus thwarting fire use due to high-density planting (150-200 TPA) and high investment.

The DEIS reforestation approach is not the thoughtful, site-sensitive, topography-responsive, fire-sensitive clumping or cluster-planting strategy we were recommending in our scoping letter nor is it consistent with intentional forest management that claims to be adopting GTR-220 heterogeneity principles. Instead we read that site stocking levels in the 1991 FSH 2409.26b Reforestation Handbook are “minimum and recommended” levels of trees per acre (DEIS 3-157) and that 150-200 trees per acre are “needed to establish a growing forest.” A different strategy or density would not be a “growing forest?”

Response: Historically Forest Service "standard" planting strategies have been to plant individual trees evenly spaced on an 8 foot by 8 foot to 12 foot by 12 foot spacing resulting in between 300 and 400 trees per acre regardless of landscape position. The idea of variable density planting using landscape position is a fairly recent agency strategy and has been really developed within the past 10 years. The proposed planting of lower densities at wider spacing (clumps of trees spaced between 21 to 33 feet apart with tree density dependent upon landscape position and management zone as described in pages 15 to 17 of the FEIS is a new and more ecologically based strategy for reforestation. The FEIS in Table 2.6 on page 16 titled "Desired Stand Condition and Initial Planting Density by Location" demonstrates contemporary and science-based reforestation approach as compared to replicating previous reforested conditions (dense planting and fire exclusion).

While the Eldorado National Forest has a history of accomplishing precommerical thinning in plantations stands that is much higher than several other Forest's in the Region, the reliance on thinning to achieve desired lower density has not been included in this project. While the proposed planting strategy provides an opportunity to do a pre-commercial thin if survival levels are unexpectedly high. The planting strategy does not require that precommercial thinning be done in order to reduce tree numbers to a desired future level as can be seen in the documented mortality levels on page 15 of the FEIS. The planting strategy furthermore facilitates the ability to use prescribed fire to maintain these stands without excessively hindering burn windows to eliminate mortality of planted trees. The expectation that some mortality will be the result of prescribed fire is acceptable given the projection of mortality in these stands, whereas lower planting densities would not facilitate acceptable levels of mortality during follow-up activities such as prescribed fire.

Additionally the concern that fire effects in plantations are always worse than in non-plantation areas is not supported, though there is a recognition that plantations are highly susceptible to fire for several years. Specifically in relation to the Kyburz fire, the fire and fuels analysis in Chapter 3 of the FEIS describes the benefits of treatment following the Fred's fire during fire suppression activities on the Kyburz fire.

> "*The Kyburz Fire (Eldorado National Forest, 2013) provides an example of suppression success within a previously salvaged area. This fire started at the bottom of a slope within the South Fork American River. Diurnal winds fanned the fire up-drainage toward the community of Kyburz, (approximately one mile from the fire origin) and reburned areas within the footprint of the Freds Fire (2004). Treatments within the Freds Fire areas included post-fire logging activities to help reduce future fuel loading and snag density. The lack of heavy dead and down fuels allowed fire suppression resources to continue to construct direct control lines, keeping a safety zone around them within the "black." Salvage harvest activities in the previous Freds Fire area allowed for: a lower intensity Kyburz fire, less exposure to hazard trees, and less exposure during mop-up activities (Johnson 2013). If direct fire suppression tactics were not available, as a result of post-Freds Fire treatment and snag reductions, indirect line would have been required during nighttime operations, which would have only allowed for indirect fire suppression tactics and an increase in fire size (Jacobson 2013). Resources, including aircraft, heavy equipment, and personnel were safely able to drop water and retardant in open areas and construct line with minimal large woody debris. These tactics increased line production rates, and decreased resistance to control, allowing for resources to effectively work through the night to complete control lines and keep the fire from entering the community of Kyburz (Ebert, Personal Observation: Burn Boss-Hey Joe Prescribed Burn; Division Supervisor-King Fire, 2014*)" (FEIS, pg. 159).

227. Comment (Commenter 21): Variable planting approaches characterized in the DEIS p. 3-156 are simplistic and are not informed by recent research such as (Lyderson et al. 2013, North et al. 2012) or the thoughtful work in the Power Fire Ecological Framework (Estes and Gross 2015, Table 9, p.23)

Response: Variable density planting strategies are characterized on pages 15 to 17 of the FEIS. The FEIS in Table 2.6 on page 16 titled "Desired Stand Condition and Initial Planting Density by Location" demonstrates contemporary and science-based reforestation approach as compared to replicating previous reforested conditions (dense planting and fire exclusion). The analysis on page 208 of the FEIS describes the expected effects of treatment on competing vegetation and stand development.

228. Comment (Commenter 21): The tendency to over-stock is apparent from past actions on the El Dorado National Forest and are being repeated again based on statements in the DEIS 3-156. The "variable" planting strategy is simply an area avoidance strategy where "snag patches" and "other areas avoided during site-prep" would not be planted. Similarly, stating that areas of future mortality would be replanted absent understanding the climate signal that such mortality represents demonstrates the lack of a thoughtful, coherent long-term vision for this area.

Response: The FEIS in Table 2.6 on page 16 titled "Desired Stand Condition and Initial Planting Density by Location" demonstrates contemporary and science-based reforestation approach as compared to replicating previous reforested conditions (dense planting and fire exclusion). Within the proposed reforestation areas additional efforts to maintain a mixture of planted and unplanted areas to facilitate a heterogeneity of shrubs and forest consistent with NRV has been designed using avoidance areas, snag patches, and non-plantable sites.

229. Comment (Commenter 21): If snag retention areas are appropriate to plant (example: complex early seral habitat is abundant and conifer seed sources are a long distance from the site), planting in snag patches may be appropriate. If worker safety is an issue (as claimed on a recent King Fire field trip) then why are wildlife staff, researchers and monitoring crews regularly entering these areas to conduct survey work on a daily basis?

Response: Snag areas and other avoidance areas within the larger planted area have been identified as providing additional heterogeneity desirable throughout the planted units, and are therefore identified to provide non-tree cover within these stands for the foreseeable future.

Immediately following the wildfire there are areas with massive quantities of dead trees, however for the most part, except where the roots of these trees are burned out or where little wood is left to hold the stem vertical, these trees are still solid as insects and rot are not an immediate result of the fire. However, as the time from the fire increases, trees become less stable, so while it may be acceptable to work in an area immediately following a fire, the risk of trees falling increases as the rot within the trees increase as time from the fire increase, until most of these trees are fallen (shown to be approximately 8 years in Ritchie et al. 2013).

230. Comment (Commenter 21): Please explain why the 2015 Power Fire Ecological Framework (PFEF), written and well-referenced by Forest Service Province Ecologists, is only recommending planting more than 150 trees per acre on moister, lower slope environments (PFEF p. 23)? With this high level of over-stocking in the proposed action the Forest Service will

insure that fire exclusion due to plantation fire risk in dense plantations and investment cost risk will once again limit fire use in this landscape, and will once again be cited as part of the list of causes for why this landscape burned with high-severity effects in the next fire.

Response: The Power Fire Ecological Framework has been developed for that landscape and is not directly applicable to the King Fire Landscape, however, the Power Fire Ecological Framework recommended densities for landscape positions have been derived from the same sources as the King Fire. The Power Fire framework has a target of 134-250 TPA with a stocking density of 172-312 TPA, while the King Fire in the conifer resilience areas has the same target of 134-250 TPA with a stocking density of 161-300 TPA. Additional work on planting densities is being conducted based on the time since the fire and competing vegetation with resulting recommendations resulting in higher initial densities identified as needed for the Power Fire compared with the King Fire restoration work.

It has been shown that lower slope areas typically have higher soil moisture potential and are more appropriate for higher densities than upper and mid slope positions which are proposed for lower planting densities. Planting on units that contain lower slopes amount to approximately 8 percent or 915 acres of the proposed King Fire planting (FEIS, Appendix D).

231. Comment (Commenter 21): Unless there are serious changes in the reforestation strategy including additions of staged cluster planting and rapid fire return we will have a “business as usual” planting strategy that will not accomplish the purpose and need, nor will it respond to NEPA’s requirements for rigorous examination of reasonable alternatives. By staged we mean reforestation that continues as needed in 5-10 year cycles based on periodic needs assessments and also based on fireshed planning and Rx fire entries. Staging also insures the continued coordination necessary to prevent large-scale dense plantations from thwarting fire-landscape realignment efforts.

Image above: From D. Nelson PPT presentation. This is not business as usual. SFL contends that cluster planting allows fire in openings when clusters are well-tended (fire-proofed essentially to develop seed tree age).

Response: The cluster planting concepts identified in the King Fire Restoration Project used the concepts presented by Duane Nelson, referenced in the comment, in developing the proposed planting design in addition to strategies to vary the planting densities and cluster sizes by management zone and landscape position. Initial planting densities proposed were identified in the project based on values for differing landscape positions in a fire-active forest described in Lydersen and North 2012 along with some initial mortality and the 4 to 15% long-term mortality based on active-fire, old-growth forest mortality rate from Ch. 2 in GTR 237 (FEIS, pg. 16). Variable density planting strategies are characterized on pages 15 to 17 of the FEIS. The FEIS in Table 2.6 on page 16 titled "Desired Stand Condition and Initial Planting Density by Location" demonstrates contemporary and science-based reforestation approach as compared to replicating previous reforested conditions (dense planting and fire exclusion).

Additional entries to plant would require release treatments and increase the time where fire would be likely to cause undesirable damage to planted seedlings, and therefore would also likely restrict the use of fire within planted areas from the current proposal. The Fire Management Strategy for the King Fire defined areas that will be used in prescribed burning efforts to facilitate burning within the newly established forest.

Planting within the King Fire area would occur over several years as site preparation work including salvage, piling, mastication, and biomass treatments are completed and as organizational capacity allows. It is currently estimated that initial planting would take at least 3 years to complete for the Proposed Action with a fairly ambitious reforestation program occurring each year. Where mortality of planted seedlings is unacceptable as defined in the FEIS (pg. 17) follow-up interplanting would occur. Future planting and treatment of additional

areas not included in the King Fire Restoration Project are not precluded by this project and may be undertaken in the future and would provide for additional sequencing.

232. Comment (Commenter 21): Fire Ecological Report Fred's Fire Seedling Survival Raises Questions Regarding Reforestation Needs and Impacts from Multiple Herbicide Applications.

The Inventory and Monitoring of Current Vegetation Conditions, Forest Stand Structure, and Regeneration of Conifers and Hardwoods throughout the Freds Fire Burn Area (Bohlman and Safford 2014) (hereafter Fred's Fire Report). The report looks at various post-fire ecological responses in the 7,700 acre 2004 Fred's Fire, a partial reburn of the past Cleveland, Wrights, and Ice House fires and is directly east of the King Fire perimeter on the Eldorado National Forest. Data is from stand exams and regeneration plot information collected during 2009, 2012 and 2013 field seasons.

Important information from the Freds Fire ecological assessment includes:

- Overall medium seedling density was 285 seedlings per acre which is above Forest Service target stocking rates for mixed conifer forests.
- Yellow pine seedling density peaked in plots burned at moderate severity.
- Pinus and Quercus ssp. both exhibited an annual survival rate from 2009-2012 of approximately 70%.
- 2012 shrub cover showed no relationship with seedling survival but 2009 shrub cover showed a positive relationship, indicating that higher shrub cover early on (5 years post-fire) may positively impact seedling survival (especially oaks) 3 years following fire.
- The amount of coarse woody material and fine fuels in burned plots averaged 10.8 tons per acre.
- Non-native species richness was highest in in the highest fire severity classes.

Overall this report raises serious questions regarding the need for active planting in the King Fire perimeter. With medium seedling densities at 285 seedlings per acre and 1,619 seedlings per acre in moderately (50-75% BA mortality) burned areas, 849 seedlings per acre in higher intensity areas (75-90% BA mortality) and 202 seedlings per acre in the highest fire severity class (>90 BA mortality), it calls to question the need for intensive reforestation on the 11,561 acres to be replanted under Alt. 2 in the King Fire DEIS.

With yellow pine seedling density peaking in the areas burned at moderate severity, this result tracks with the outcome expected from the natural fire regime of mixed severity fire in dry, mixed conifer forests. There should be no salvaging in low-moderate burns in the King Fire since these fire effects should be thought of as a treatment and not a problem to be somehow fixed.

In the report, early shrub cover was found to increase seedling survival in the first critical 3 years post-fire. After year 3 no trend was shown (Fred's Fire Report p, 12). Shrub species contribution to conifer seedling survival coupled with thoughtful management (predominantly with frequent fire and hand tools) of selected "clusters" of free-growing or planted seedlings is what we have recommended in our DEIS comments. This strategy is most consistent with the NRV with active fire which should be the King Fire desired condition.

A further concern is the presence of high levels of non-native species that is likely due to repeated selective herbicide treatments in the Fred's Fire perimeter and unprecedented level of non-native grasses and weeds due to lack of fire and heavy herbicide use for reforestation. This situation

seriously complicates reintroduction of fire into this landscape and should not be repeated in the King Fire restoration effort.

Response: As discussed on page 205 of the FEIS in regards to Bohlman and Safford (2015): "an exponential reduction in regeneration was seen as distance to nearest seed source increased beyond 100 feet. While average seedling and sapling density appears high throughout the plots established in the Fred's Fire, it was found that for all species, in all severity classes, with the exception of ponderosa pine, the median number of trees per acre was 0, indicating that while some areas had prolific regeneration, in most areas low or no regeneration is occurring".

As stated by the authors in the Fred's fire report: "The relatively high success of Pinus ponderosa regeneration in the Freds Fire perimeter is somewhat unique in our experience (we have similar regeneration inventory projects on about 15 other fires)" (Bohman and Safford (2015).

According to the report ponderosa pine had a median of 92 trees per acre in areas that burned at greater than 90% basal area loss. When the total number of seedlings and saplings per plot were regressed against distance to the nearest seed source they showed an exponential decrease as distanced increase. This same relationship was seen for all species. When seedlings and sapling densities were regressed against shrub cover, both conifers and hardwoods showed a negative relationship with shrubs indicating that as shrub cover increases, regeneration tends to decrease.

The results of this study were inconclusive on trends for shrub cover and survival in seedlings. While it is possible that under specific circumstances shrub cover may benefit the survival of seedlings, there have been ample examples on the Forest and in the literature of increased mortality with increased shrub competition.

As described in McDonald and Fiddler (2010):

"*Over 200 studies in the United States have demonstrated that small increases in the density or biomass of competing vegetation significantly lower conifer seedling survival and growth (Stewart and others 1984). Given the long hot summers typical of most of California, it stands to reason that competition to conifer seedlings involves adequate soil moisture, and this means that the seat of early competition is belowground at the fine-root level. A likely scenario follows: In the absence of competition, the roots of young conifer seedlings extend vertically at the maximum rate possible. They increase in width and length, number of root tips, and in moisture absorption capacity. By increasing the volume of soil exploited, they increase the amount of water and nutrients available for rapid growth. The resources stored in or acquired by the root system lead to production of more aboveground biomass and more carbohydrates. This in turn fuels additional growth both above and belowground in a manner that accelerates each year. But competing shrubs and grasses, if present, characteristically begin root expansion and soil exploitation earlier in the growing season and in greater amounts than the conifer seedlings and capture the bulk of available site resources. The contrast between new pines and grass is striking. Based on measurements of several thousand seedlings from federal, state, and private nurseries, a typical 1-year-old ponderosa pine seedling had a total root length of about 78 in (McDonald and Fiddler 1989). A single wild oat plant excavated 80 days after emergence had developed a root system that totaled over 50 mi in length (Radosevich and Holt 1984). The lack of initial resources stresses the conifer seedling by causing decreased root expansion, less resource collection, poor growth, and, in many instances, death.*"

The photo below provided by Ryan Tompkins, Forest Silvicuturist from the Plumas National Forest displays the difference in root size between a 1 year old plug seedling and reestablishing ceanothus, arctostaphylos, and other one year old shrubs.

Effective vegetation control is particularly critical for the establishment of non-ponderosa pine conifers, such as white fir, Douglas fir, sugar pine, and incense cedar. These species typically have much lower early survival success than ponderosa/Jeffrey pine.

The assumption by the commenters that higher densities of non-native species were developed in the high severity areas of the fire by repeat is not supported. Herbicide release of the Fred's Fire plantations did not begin until the spring of 2010.

Areas that burned at moderate severity are not proposed for reforestation under the King Fire Restoration Project. Salvage logging in these areas is not proposed to facilitate reforestation. It is proposed to maintain strategic fire management zones and public safety as identified in the purpose and need for the project.

233. Comment (Commenter 21): Assumptions in the DEIS about Natural Regeneration are Arbitrary and Biased. We take exception to the photo on p. 3-151 3V.4. The Cleveland Fire photo is the "old chestnut" the Forest Service troops out to demonstrate to the unsuspecting public a version of "passive" management supposedly making some poorly defined case for massive salvage logging projects followed by multiple toxic chemical applications and industrial tree farm plantations. This "plant, spray and pray strategy" is not only profoundly unsuccessful as demonstrated by recent fires cited above, it is economically costly to taxpayers even if offers "make work" opportunities for the Forest Service, and it is an ecologically outdated forest management strategy.

What we actually see across the whole of the King Fire landscape is near total exclusion of fire, the primary ecological process operating in this landscape. We see the dramatic loss of large old growth trees from a century of logging which will take centuries to repair, at-risk wildlife species in serious population declines (mentioned above) and costly, sterile and fire prone plantation forestry still capturing the minds of the next generation of foresters.

Below is another picture of the same 1992 Cleveland Fire event showing a biologically and structurally diverse landscape that has experienced little or no active management since the ignition date. This is a rich, complex and vibrant landscape which should also be represented in any honest discussion of the effects of management. NEPA 40 CFR §1502.24 requires professional and scientific integrity in public disclosure.

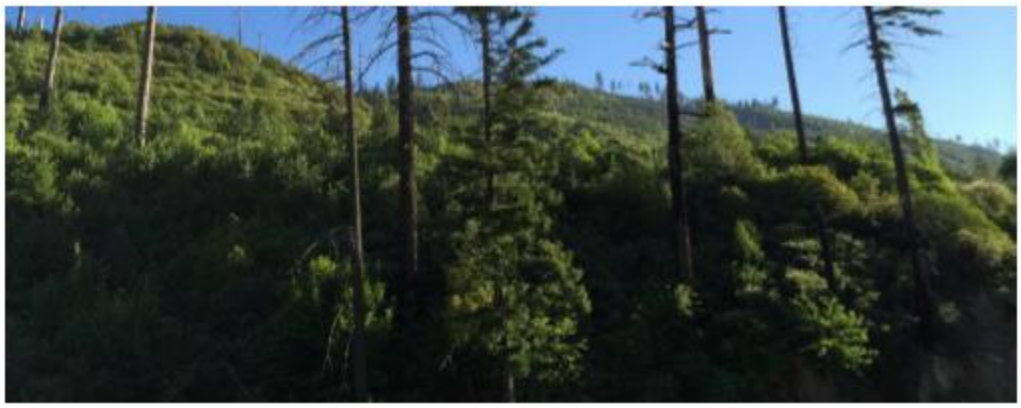


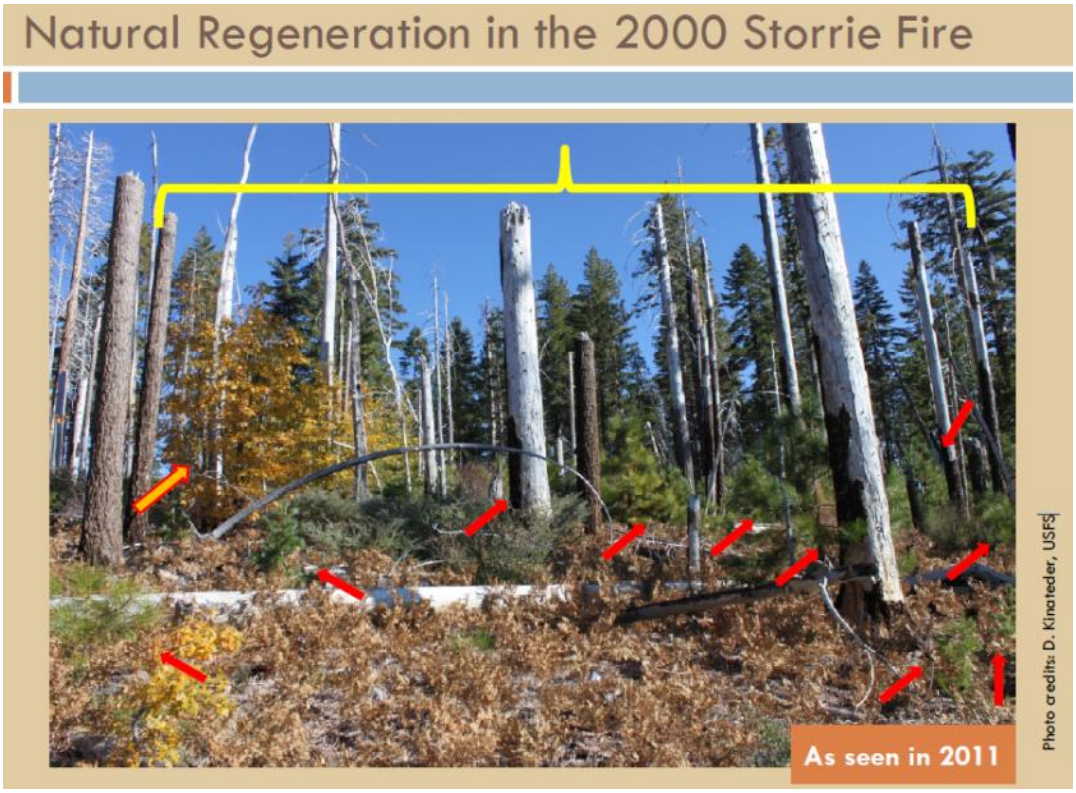
Image above: North slope Cleveland Fire Highway 50, east of St. Pauli's Restaurant

Response: The Forest Service included the 1st photo, above because we believe it helpful to portray the 40 acre piece of Forest Service land on high timber site that was intentionally set aside after the 1992 Cleveland Fire for future reference to demonstrate the successional processes at play on a burned landscape that was not salvaged and not reforested and that had few surviving seed trees. Inclusion of the photo in the analysis did not include assigning value to the vegetative condition, but merely to visually demonstrated that no; or limited actions have certain, predictable consequences. "*This site was established to contrast natural recovery with the plantation establishment in the Cleveland Fire. Figure 3V.4 displays the study area in the foreground dominated by shrubs with very few seedlings visible compared with the established approximately 20-year-old plantations in the background*" (FEIS pg. 203 to 204).

In addition to the plot on the Eldorado National Forest established following the Cleveland Fire, other examples of reforested and unmanaged areas exist across the Region following high intensity fires including the photo below of the Fountain Fire. There is ample scientific evidence and observations that natural regeneration is unlikely to establish with large portions of the burned area proposed for reforestation, within the next several decades. Therefore, reforestation is likely to provide the only coniferous trees for decades into the future, while a large portion of the mixed conifer forest stands that burned at high severity would provide for early seral shrubfield habitat.

Fountain Fire in Northern California, contrast of planted and non-planted (2007) (Photo by Jianwei Zhang, USDA Forest Service PSW Research Station)

Furthermore, where natural regeneration is likely to establish following the fire does not assure that it will be able to persist into the future without management efforts. As can be seen from recent Forest Service examples in the Sierra Nevada where the decision to not manage areas was specifically made, future fires can further eliminate natural regeneration and seed sources from the landscape. These areas would have been very difficult to prescribe burn due to fire fighter safety and risk of mortality of regenerating tree.


Natural Regeneration in the 2000 Storrie Fire
As seen in 2011
Photo credits: D. Kinateder, USFS

Post-fire landscapes are dynamic:
2012 Chips Fire Re-burn of 2000 Storrie Fire
As seen in 2012
Photo credits: D. Kinateder, USFS

The 2nd photo above showing the north aspect of the 1992 Cleveland Fire represents a moderate intensity burn area with some remaining live trees on the lower slope near the South Fork of the American River. This area is immediately east of the old St Pauli Inn (stand 614-0038). The commentor's description that this area is "a biologically and structurally diverse landscape" is informative and probably quite true, however the assertion that this landscape developed as a result of "little or no active management" is not true and the actual history of the 10 year reforestation effort is enlightening. According to District silvicultural records, the area shown in the photo received fairly typical reforestation treatments that are quite similar to those proposed in the King Fire Restoration project.

After the Cleveland Fire, this area in the photo was salvaged in 1993, then planted in 1995, chemically released in 1996, and chemically released in 1998. In 2008, upper portion of the stand pre-commercially thinned. If the above treatments resulted in "a rich, complex and vibrant landscape" as the comment asserts, then it is probably fair to say that similar results are likely to be achieved with the proposed silvicultural treatments for this project. It also is important to note that even with the completed silvicultural treatments at the time of establishment, these stands remain at a high risk for loss and are being analyzed for future treatments under the South Fork American River Cohesive Strategy.

234. Comment (Commenter 21): Increased Fire Hazard due to the Large Number of Plantations with Highly Fire Prone Structure and Composition, on Public and Private Lands.

In these comments, we are reiterating some of the information we have provided earlier in the document, from the perspective of the effects on native plant communities and the wildlife that depend upon them. Reburning from future mega-fires in plantations will contribute to a trend towards type conversion of the forest to human-dependent tree cropping systems and non-native weed species. Climate change feeds into this loop, inevitably resulting in ever more fires and loss of species.

The proposed activities in the King Fire project truncate or skip ecological processes altogether, target non-conifer native forest species for elimination, and simplify forest structure and composition in order to grow a tree crop. As the Forest Service's most famous ecologist Aldo Leopold said:

> "The last word in ignorance is the man who says of an animal or plant, "What good is it?" If the land mechanism as a whole is good, then every part is good, whether we understand it or not. If the biota, in the course of aeons, has built something we like but do not understand, then who but a fool would discard seemingly useless parts? To keep every cog and wheel is the first precaution of intelligent tinkering." –Aldo Leopold

Hundreds of acres of plantations planted by the Forest Service and industrial timber companies burned at high severity in the King Fire. The acreage and locations of previous plantations must be included in the EIS to allow for a comparison between past practices, the current proposal, and to allow examination of the cumulative effects of past practices.

Reforestation as proposed by the ENF is an agricultural endeavor, not grounded in ecology. The goal is to quickly grow tree fiber for commercial use. In so doing, reforestation activities contribute significantly to the fire and fuels problem in California's Sierra Nevada, and contribute to the further decline of wildlife, water quality, and other environmental amenities. There is no ecological justification for the proposed reforestation activities.

In testimony on September 22, 2004 before the Senate Committee on Energy and Natural Resources, the venerable Dr. Jerry F. Franklin, Professor of Ecosystem Science at University of Washington, cautioned:

> "Where management goals include maintenance of native biodiversity and ecological processes associated with natural ecosystem recovery, then a universal mandate for timber salvage and artificial reforestation is inappropriate…In some cases, reforestation of fire-prone sites with full stocked plantations is actively recreating the fuels that will feed the next unnatural stand replacement fire".

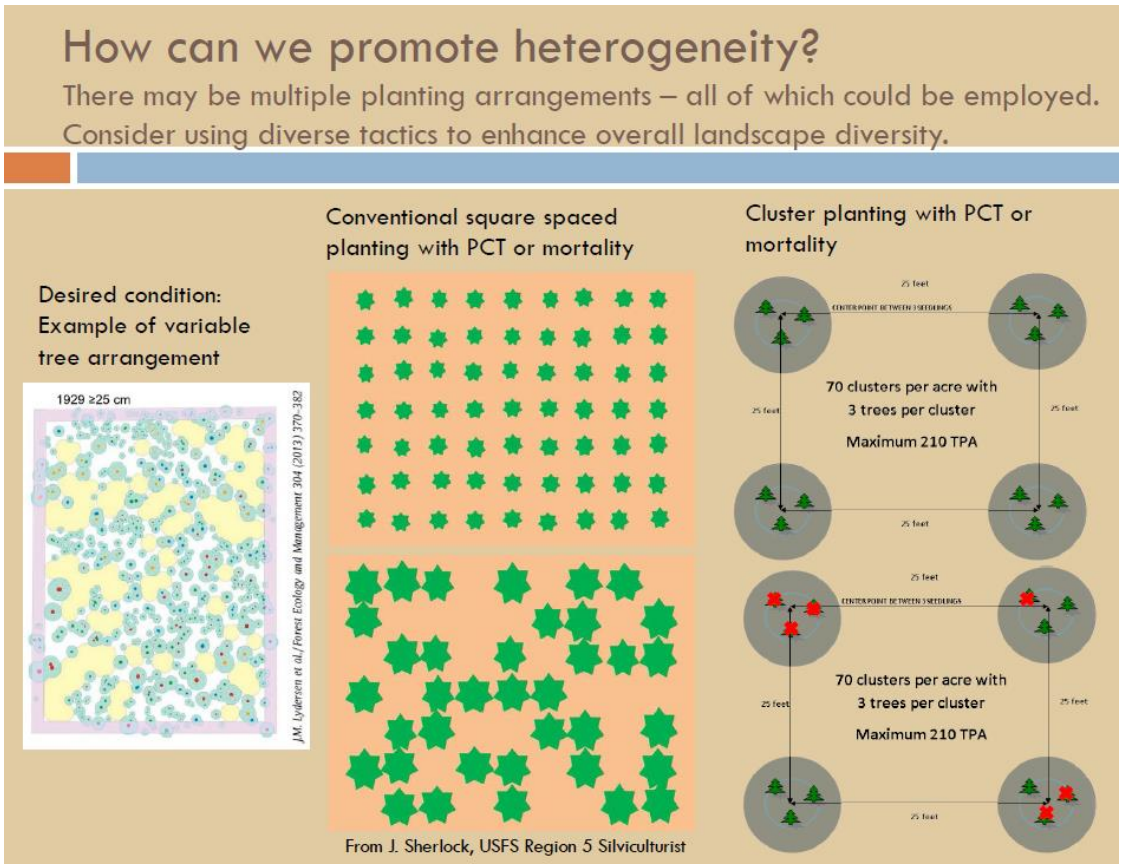
It is not necessary to bulldoze, spray, and plant to get a forest back. Nature has grown immense forests long before silviculturists came along. Forest Service research scientists have affirmed this (McDonald and Fiddler 1993), although the intention of this 1993 paper was not to affirm our position against herbicide use. Nevertheless, the researchers did conclude that trees grow without herbicides—a fact that should be obvious.

There are few that know more about growing old-growth forests than Dr. Franklin, who also said, "Fifty years for natural reestablishment of forest cover is not a particularly long period." The DEIS failed to offer any discussion as to why you are in such a hurry. Even in areas where the seed bank has been depleted, it is not necessary to interrupt the natural process with large scale intervention. Is it the revenue that salvage logging and planting (KV funds) will bring in? If so, this should be stated up front in the DEIS. Indeed, in 2009, a federal 9th circuit judge criticized the Forest Service for biased decisions about logging projects due to financial incentives:

> "The financial incentive of the Forest Service in implementing the forest plan is as operative, as tangible, and as troublesome as it would be if instead of an impartial agency decision the agency was the paid accomplice of the loggers….Against this background of precedent, the Forest Service's own regulation requires that the Forest Service 'objectively evaluate all reasonable alternatives.' 40 C.F.R. § 1502.14(a) (2000). Can an agency which has announced its strong financial interest in the outcome proceed objectively? Could an umpire call balls and strikes objectively if he were paid for the strikes he called?" (Sierra Forest Legacy et al v. Rey et al, 577 F.3d 1015 9th Circuit 2009).

Response: See the purpose and need for action FEIS pgs. 4 and 5 for the purpose of the project. The reasons for past plantation establishment along with the principles of plantation establishment have changed throughout the decades. The reestablishment of plantations in the King Fire is result of a thoughtful effort described in the "King Fire Vegetation Resilience and Restoration Assessment" (Appendix B of the FEIS).

Numerous methods could be used to achieve a diverse, heterogeneous stands regardless of the planting design as displayed in the slide below. However given the extent of reforestation needs in the King Fire, this project has identified low density cluster planting as the best method here to achieve a desirable future stand structure in conifer forests proposed for regeneration to minimize the risk associated with not being able to perform future pre-commercial thinning treatments on the ground.



Reforestation concepts in relation to future stand heterogeneity. Slide provided by Ryan Tomkins, Forest Silviculturist for the Plumas National Forest

235. Comment (Commenter21): The risks to wildlife, including pollinators that are increasingly threatened throughout the continent and the loss of native species outweigh the projected benefit of accelerated growth of conifer trees. In light of climate change, the projected future growth and harvest are speculative, and may have little chance of success in any event. The planted trees certainly will not meet the definition of ecological integrity as described by the 2012 Forest Planning Rule:

> "The quality or condition of an ecosystem when its dominant ecological characteristics (for example, composition, structure, function, connectivity and species composition and diversity) occur within the natural range of variation and can withstand and recover from most perturbations imposed by natural environmental dynamics or human influence" (36 CFR § 219.19).

Response: The Forest Service recognizes the importance of the early seral habitat for pollinators and other wildlife. As stated in the FEIS: "Maintaining multi-structure early-seral conditions is important across the King Fire area for: 1) supporting wildlife that require post-fire snags and shrubs, 2) breaking up the continuity of adjacent seral stages, and 3) allowing natural succession to proceed: (FEIS, Appendix A, p. 11). All alternatives propose to maintain 14-17% of CESF (FEIS, Appendix A, p. 10).In order to address a changing climate, the King Fire Vegetation Resilience and Restoration Assessment (Appendix B) used bioclimatic envelope modeling to identify those areas that were likely to maintain forest in the future (FEIS pg. 23).

The reforestation has drawn on multiple guiding principles to help maintain ecological integrity (FEIS pg. 11).

236. Comment (Commenter 21): Ceanothus are nitrogen-fixing shrubs that play a critical role in forested ecosystems to build sufficient nitrogen in the soil to ultimately support climax conifer species. The ecological role of these shrubs is unequivocal: they build soil, they provide nectar and pollen for pollinators and other species, provide food and shelter for deer, and food and nesting materials for birds. It is remarkably short-sighted to think that forest ecosystems can simply do without these species across thousands of acres of clearcuts and plantations. Indeed, some research has shown that over the long term, conifers grow equally well on sites where the shrubs and hardwoods have been left in place. This is mostly dependent upon the soil site conditions. Sites with very rocky soils depleted of organic material will have a very difficult time supporting conifers until the soils have been improved through the action of natural succession. This is where the nitrogen-fixing shrubs like Ceanothus are necessary after fire. The environmental impact analysis must include taking a hard look at these issues and analyze the contribution that Ceanothus, manzanita, Cercocarpus and other shrubs make to soil health, pollinator and avian viability, and reduced fire hazard (Horowitz 1982, Conard et al 1985). Research conducted at the Teakettle Experimental Forest in the Central Sierra concluded that "Ceanothus contributes to a greater proportion of total N mineralized than based on cover alone, and may be important for forest nutrition under current conditions and after forest burning" (Erickson et al 2004). Other researchers have stressed the importance of maintaining pioneer species because of the mutually beneficial linkages with soil microbiota and mycorrhizal fungi that are important for reestablishment of the forest in later successional stages (Horowitz 1982, Molina and Amaranthus 1991).

Other nitrogen-fixing shrubs and perennials that are abundant after fire include Alnus, Cercocarpus, Lupinus, Lathyrus, Astragalus, Trifolium, Alnus, Vicia, and Lotus, and many others. Rather than killing these beneficial plants, Jurgensen et al (1991) suggest leaving a mosaic of beneficial species like Ceanothus while others suggest actually planting these species where needed to replenish soils (Everitt et al 1991).

Response: Erikson et al found that in mineral soils, total N pools under Ceanothus exceeded those under closed canopy patches by about 30%. For 2 years, nitrate concentrations and rates of net N mineralization in O horizons were greater under Ceanothus than under the other patch types. Similarly, ammonium concentrations and net N mineralization in mineral horizons were more than 80 and 200% greater, respectively, under Ceanothus than under the other patch types. In situ fluxes of nitrate were greater beneath Ceanothus for 1 year, and no differences were found among the patch types for another year. Despite the interannual variability, data suggest that Ceanothus contributes to a greater proportion of total N mineralized than based on cover alone, and may be important for forest nutrition under current conditions and after forest burning. Findings suggest that Ceanothus patches and perhaps open canopy areas, which tended to have greater mineral horizon N pools than closed canopy areas, may be important for future forest regeneration and productivity. However, other potentially competing processes could diminish this effect. For example, open canopy soils, with greater rock fragment volumes and higher bulk density than the other soils, may not retain sufficient moisture for seedling establishment after fire. Also, resprouting of Ceanothus is often common and rapid after fire, suggesting that Ceanothus may again dominate N-rich sites after disturbance rather than facilitating seediling establishment. Conard et al. (1985) discuss that effects of Ceanothus on environmental factors-such as light, water, and temperature-as well as production of allelopathic

substances can potentially affect the growth and survival of conifers. The result is that Ceanothus species have the potential to compete strongly with conifers and to reduce conifer growth.

Proposed herbicide use is expected to reduce, but not eliminate shrub cover within the treatment units, and to increase cover of herbs and forb. Areas treated by glyphosate are expected to have shrub levels of less than 30 percent for at least 10 years. Since glyphosate is a contact herbicide that has no pre-emergent effect, vegetation present prior to the treatment would begin to re-establish following treatment. Plants would develop from seed in the soil, neighboring treated areas, and through recovery of plants surviving initial treatments (FEIS, pages 208 to 209).Lower sites with very rocky soil have been excluded from planting under the King Fire Restoration Project as described in the "King Fire Reforestation and Resilience Strategy" (Appendix B of the FEIS).

237. Comment (Commenter 21): Another successful strategy to minimize competition with planted conifers in the PNW region 6 is to plant trees that are at least two years old. Region 6 has the same requirement as California, e.g., herbicides may only be used as a last resort where found essential to obtain management objectives. Unless there is a requirement in the purpose and need to grow conifers to marketable size in 30 years (and this could only happen on high soil sites under the best of circumstances, which we presently do not have because of climate change), then herbicide use cannot be found to be essential.

Response: Larger seedlings are more expensive and may not perform better given dry site conditions in the Sierra Nevada. In the Douglas-fir forest of the Pacific Northwest increased foliage provided by increased tree is beneficial to growth of stands because trees are able withstand more deer browse and to take advantage of increased soil moisture and outgrow competing vegetation (Fitzgerald 2008). However, in the Sierra Nevada where sites are drier, it is important that the root to shoot ratio is more heavily weighted toward roots so that trees can persist through the dry hot summer period present in this Mediterranean climate. Larger tops that come with older seedlings, if not also accompanied by an extensive root system, increase the probability of plantation failure on these sites because of the increased evapotranspiration of the seedlings. While on some sites larger trees are able to better capture available resources, larger seedlings further complicate out planting by reducing the number of seedlings that can be carried by planters each trip, increasing the time to plant each seedling, and increasing the time to grow seedlings in a nursery which allows competing vegetation to capture more of the site between site preparation and planting, all of whichincreases cost.

Fitzgerald, S.A. 2008. Successful Reforestation: An Overview. The Woodland Workbook: Reforestation. EC 1498. Extension and Station Communications. Oregon State University. Corvallis, OR.

Sensitive Plants

238. Comment (Commenter 21): Potential Effects of Herbicide on Acrtostaphylos nissenana
Two basic life history patterns are found among species within the genus Arctostaphylos with respect to wildfire; Arctostaphylos plants either survive wildfire and resprout from a basal burl (sprouter) or Arctostaphylos plants are killed by fire and regenerate from seeds stored in the soil (obligate seeder). Almost all at-risk species in the genus Arctostaphylos have the obligate-seeding strategy. Based on the species account in the DEIS, it is likely A. nissenana is an obligate seeder. Obligate seeding Arctostaphylos species require 5 to 25 years before substantial seed crops are produced (Keeley 1986). Seeds typically suffer high rates of predation (Kelly and Parker 1990);

however, seed caching by seed predators may be an important mechanism by which seeds are buried to a sufficient depth at which they may survive high-intensity wildfires. Parker (2010) found that while overall seedling density declined with fire intensity, the proportion of seedlings emerging from rodent caches increased. Seeds that are not eaten are slowly added to the soil seed bank, eventually reaching depths at which they can survive fire (Parker 2007). Obligate seeding Arctostaphylos species tend to have fire-dependent seedling recruitment; and mature stands tend to be even-aged, exhibiting little to no regeneration during fire-free intervals (Safford and Harrison 2004). Because most Arctostaphylos are shade-intolerant, in the absence of fire, stands may be "shaded-out" by trees and succeed to forest. However, seed viability may last many decades and it is not uncommon for wildfires to germinate long-dormant seedbanks in areas Arctostaphylos were not known to occur prior to the fire. Since there have been very few fires within the project area over the past 100 years, it is entirely possible populations of A. nissenana succeeded to forest and long dormant viable seedbanks were "awakened" by the King Fire in locations the species was not previously known to occur. Considering that all of the action alternatives proposed in the DEIS include many thousands of acres of salvage logging and vegetation control associated with reforestation, including thousands of acres of herbicide treatment of shrubs in the genus Arctostaphylos, we ask that you develop measures to survey for, identify, and avoid A. nissenana during project activities that may result in injury or death of the species in areas the species was not known to occur prior to the fire. The forest plan requires surveys to be undertaken prior to activities in sensitive plant habitat.

Response: Protection measures for *A. nissenana* and other sensitive plants are included in the project design criteria in Chapter 2 of the FEIS. Botanical surveys for sensitive plants, including A. nissenana, were completed within the project area during May, June, July and August 2015. Surveys were conducted at previously known occurrences and in potential habitat within the project area. Seedlings of *A. nissenana* were observed during the surveys at known occurrences, and several occurrence boundary extensions were documented. Survey results have been incorporated into Biological Evaluation.

239. Comment (Commenter 21): Further, there needs to be a methodology to ensure that less common species are preferentially maintained and not mistaken for widespread and common species. For example, Garrya fremontii or Fremont's silk-tassel, occurs in the King Fire, but has become uncommon on the ENF due to previous management activities both on private and public lands. It can be expected to be replenished locally by the fire from an existing seedbank. As it is not common on the forest, but looks almost exactly like manzanita to the untrained eye (prior to blooming), indiscriminate spraying will likely result in loss of this important browse species (Sampson and Jespersen 1963). The EIS must identify a methodology to ensure that management activities do not contribute to loss of biodiversity through an unfortunate lack of knowledge of the native forest species composition.

Response: There are multiple approaches to protecting botanical biodiversity incorporated into the project. The Eldorado National Forest maintains a watch list of botanical species that are of conservation concern, but have not been designated as Sensitive by the Regional Forester. This list includes species that are newly described; locally rare; range extensions or disjunct populations; plants of specific public interest; or species with too little information to determine their appropriate status. These species make an important contribution to forest biodiversity and are protected under the provisions of the National Forest Management Act. Design criteria to protect watchlist plant occurrences are included in Chapter 2. In addition, lava caps, which are hotspots for biodiversity and support many uncommon species, including Garrya fremontii, will

be flagged for avoidance during project activities including release treatments (FEIS, Chapter 2, Table 2.15, pg. 32). Vigorous stump-sprouts of Garrya fremontii have been observed in lava caps during botanical surveys. The matrix of riparian conservation areas, snag retention patches, natural regeneration units, reforestation units, and untreated areas will contribute to biodiversity across the analysis area. Within reforestation units, the following project design components will contribute to the retention of biodiversity: variable-density cluster planting, areas of radial release, allowance for up to 30% shrub cover in the understory, use of an herbicide with no pre-emergent properties, and retention of herbaceous understory vegetation.

240. Comment (Commenter 21): We appreciate the commitments to flag and avoid as well as monitor management activities in the vicinity of sensitive plant populations in the King Fire project area. However, we remind the agency that the 2004 Sierra Nevada Forest Plan Amendment Supplement directs the agency to design projects to "conserve or enhance" sensitive plant species and their habitat, which means that simply flagging and avoiding existing populations is not a sufficient mitigation. In these populations, if the fire has improved habitat for the species, plantation units should not be installed at these sites. These sites should be managed in perpetuity for the benefit of the rare plants, which may mean reintroducing fire at regular intervals. Furthermore, the Forest Service must incorporate survey information "early" in the planning process in order to "[m]inimize or eliminate direct and indirect impacts from management activities" on sensitive plants unless the activity is designed to maintain or improve plant populations (SNFPA Standards & Guidelines, Vol. 1, p. 366). Surveys must be conducted according to the procedures outlined in the Forest Service Handbook (FSH 2609.25.11). Since the massive fire has now done the job of improving habitat for these plants, and possibly others that are yet unknown, it is incumbent upon the Forest Service to not endanger this process during salvage logging and planting activities. Without prior surveys, there is no way that the agency can guarantee the effectiveness of the proposed sensitive plant mitigations. No ground disturbing activities may be permitted until surveys have taken place.

Moreover, it is essential that populations that burned in the fire are protected, even if the plants appear to have been burned. The species are still there, in the form of seeds, in the soil. No salvage and reforestation activities are permitted in this habitat. This needs to be clarified in the FEIS as it is not clear in the draft document. These requirements apply to ALL sensitive plant species. "Resource plans and permits, contracts, and other instruments for the use and occupancy of National Forest System lands shall be consistent with the land management plans." 16 USC. § 1604 (i). See Neighbors of Cuddy Mountain et al. v. USFS (9th Circuit 1998) 137 F.3d 1372. Also See Sierra Club et al. v. Eubanks, et al. No. Civ. S 03-1238 (Duncan Canyon Roadless Area, on the Tahoe NF).

Response: Botanical surveys for sensitive plants within the project area were completed during May, June, July, and August 2015 the earliest possible timing during the planning process to ensure plant phenology allowed for identification, and early enough to effectively incorporate the information to protect botanical resources from impacts. Survey results have been incorporated into the Biological Evaluation. Design criteria include flagging and avoiding sensitive plant occurrences and lava caps during reforestation (FEIS Table 2.15, BR-5). Many sensitive plant species are fire-adapted or fire-dependent. The project is designed to facilitate reintroduction of fire in the future and also includes prescribed burning in the northern portion of the fire area (FEIS, Chapter 2).

A strong post-fire regeneration response (either by seed or re-sprout) has been observed for sensitive species previously known in the fire area, and it is assumed that individuals would have been observed during surveys at or in the vicinity of historic occurrences if the species or propagules were present. Unoccupied historic occurrences will not be flagged for avoidance where it is unlikely the site will be re-occupied in the future (due to mis-mapping or change in site conditions from pre-fire disturbance). For the annual species yellow-bur navarretia, small occurrences in disturbed areas (landings, roads, etc.) or minor ephemeral opening will not be protected, as there is substantial natural occupied habitat within the project area, the number of individuals and extent of occurrences vary greatly from year to year, and the species readily recolonizes disturbed areas (FEIS pg. 65). The botanical analysis in the FEIS has been clarified, and the design criteria in the FEIS have been revised slightly to address the comment and incorporate survey results.

Society, Culture and Economy

241. Comment (Commenter 21): Reforestation, as proposed, is not economically justified.

Response: Reforestation is not proposed only for economic benefits. The cost benefit ratio of planting and release treatments is compared between alternatives simply to show the economic considerations associated with different reforestation options. None of the six Purpose and Need statements for this project, as identified on page xiii of the DEIS, identify the need to be economically justified. Purpose and Need statement #5 states, "Expeditiously recover timber killed by the fire commensurate with available markets for the purpose of generating funds to offset the cost of restoration activities and contribute to societal needs for wood products."

242. Comment (Commenter 21): Although we are sure you are already aware of this, we thought it necessary to point out that reforestation activities are the primary driver of the monetary deficits that occur under each action alternative (i.e., if reforestation activities were removed from all of the proposed action alternatives, each would produce revenue, including Alternative 3).

Response: Salvage harvest is the only activity that has the potential to generate revenue to assist in other management activities; however that does not reduce the need to do activities to move stands toward desired future conditions. Reforestation is a main component of King Fire Restoration projects as identified in the Purpose and Need statement #3 which states, "Actively manage severely burned areas to facilitate restoration and resilience."

243. Comment (Commenter 21): We believe the economic analysis may not reflect the actual current value of the timber; meaning the economic analysis may not accurately represent the ability of the timber to provide revenue that would off-set the costs of the restoration activities. From our experience with the Rim Fire, much less of the timber offered for sale actually sold, and many of the sales that were purchased sold for lower than the Forest Service had predicted in the Rim Fire EIS. As such, we ask that you update the portion of the economic analysis associated with timber revenue based on Rim Fire contracts that actually sold and we ask that you provide transparent mill capacity figures for the mills that are highly likely to purchase King Fire wood, assuming a transportation subsidy will not be provided.

Response: It is true that our estimates of the economics associated with the fire salvage may not be realized based upon the abundance of salvage that is currently being delivered to the local mills and the capacity and interest potential purchasers may have in terms of the Forest Service salvage. The stumpage prices that are implicit in the sawtimber value displayed in the DEIS, Table 3E.2 average between $49.00 to $55.00 per thousand boardfeet. However, this estimated stumpage value should be viewed only as potential revenue and does include the costs of road reconstruction which has not yet been finalized for any of the alternatives. Table 3E.2 clearly reveals that potential costs are going to substantially exceed revenues under all alternatives, but many of the actual costs will be dependent upon future contract costs that are themselves merely broad estimates at this time. The analysis for cost and value are a useful comparison of alternatives, despite the lack of exact pricing.

It is rather difficult to compare projected revenues and costs to those experienced on the Rim Fire sales because of so many differences between the logging requirements and associated costs among all the sales The following discussion compares the bid price on a recent sale sold from the King Fire on the Georgetown District and two other small sales that have recently been appraised, but not yet advertised from within the King Fire.

The stumpage rate actually bid on the sold sale from the King Fire was about $121.00/MBF adjusted for a considerable amount of slash treatment that was unique to this sale. The volume from this sold sale was purchased by a small, independent operator and the timber is being hauled to mills generally outside of the local area, i.e. Chester, Yuba River and Marysville. The two other appraised sales have average stumpage rates in the $75.00 to $113.00/MBF range with the difference between these two sales largely associated with the species mix. The estimated stumpage value for these latter two sales is based upon log delivery to the Sierra Pacific mill in Lincoln, CA.

With regard to the question concerning the actual mill capacity of those mills likely to process timber from the King Fire, the answer is difficult to come by because though the physical mill plant capacity can be reasonably estimated based upon the average volume processed through the Sierra Pacific mills in Lincoln and other mills that have received timber in the recent past from the Eldorado NF, the willingness and short-term capability of these mills to buy and process fire-killed timber from the King Fire is partially dependent upon the appraised value of the timber being offered, upon the volume of timber coming off Sierra Pacific's own land and timber from other private lands, and the degree of timber deterioration that will be experienced once the Forest Service timber is ready for harvest. For example, Sierra Pacific's small log mill in Lincoln has the capability of processing multiple millions of feet of small logs each year, however the most rapid deterioration occurs in small logs, thus it is likely that a substantial portion of their mill capacity will not be met by salvaging small trees from the Forest Service lands because the smaller trees will have deteriorated by the time the sales are available for logging. We believe it is fair to assume that there is sufficient mill capacity to process the potential volume that could be offered under each Alternative, assuming that some volume would go to the more traditional local mills and some volume may be hauled to mills not typically significant processers of Eldorado NF timber. However, it deserves to be restated that there are a lot of other economic considerations that affect the likelihood of successfully selling and processing the fire killed timber under any alternative and mill capacity is just one of the factors.

Wildlife

244. Comment (Commenter 21): Fire has been shown to play a critical role in producing an abundance of nectar volume and a diversity of nectar producing plants immediately after fire—peaking in year two—that may be necessary for the cyclic population bursts that are critical for

the survival of pollinators and the reestablishment of the plants that are their partners (Potts et al 2003, Grundel et al 2010). Potts et al (2003) found both floral abundance and nectar concentration were highest the second year after fire, and began to decrease after that. Total nectar concentration available to bees decreased by 15% from its highest point 2 years after fire; but as nectar concentration declined over time, nectar volume increased as perennial species with longer floral tubes begin to appear in succession. This is an example of the complexity of natural succession that is barely understood, and naturally regenerating forest site after fire is has now become the "rarest type of forest," (see our scoping comments documenting this, p. 8-11) with obvious negative effects on pollinator dynamics. Kearns and Inouye (1997) reported that fragmentation resulted in reduced seed reproduction and reduced adaptation fitness in plant populations, since fragmentation reduced pollination needed for outcrossing. Rare plants can become isolated in "ecological traps" (Stebbins 1979) surrounded by other types of vegetation. Pollinators frequently will not cross large distances between small populations, and some exhibit density dependent foraging behavior: "small patches suffered reproductive failure due to lack of effective pollination when critical thresholds of isolation were exceeded. In contrast, sufficiently large patches attracted pollinators regardless of their degree of isolation" (the Allee effect; Groom 1998).

On May 19, 2015, the White House released the National Strategy to Promote the Health of Honey Bees and Other Pollinators (Pollinator Health Task Force 2015). One of the commitments in the national pollinator strategy is to "Restore or enhance 7 million acres of land for pollinators over the next 5 years through Federal actions and public/private partnerships." USDA is, and will continue to be, a key player in the development of the strategy. What better action could be taken than to permit the natural succession of flowering shrubs, hardwoods, and perennial species in the plantation units proposed for the King Fire? Pollinators from many different insect families are found utilizing all the different species of Ceanothus shrubs.

Bumblebee on Ceanothus parvifolius, King Fire June 2015 in unburned area. Is it the rare Western bumblebee?

Response: Potts et al. 2003 findings are for bee-flower communities found in the Mediterranean and forest in Mt. Carmel Israel, but equate his findings to similar systems. According to Potts et al. (2003) floral abundance and nectar concentration were highest the second year after fire (FEIS pg. 285). Your comment about the natural complexity of fire as being barely understood is correct. As an example, Potts et al. (2003) identified 23 bee habitat parameters in their study. The complexities of habitat variables necessary for bees are not within the range of this analysis. The most likely areas to provide floral food sources in support of bees in the project area are predicted to be those that burned at low or moderate severity or where flowering shrubs or native plant cover are rapidly reestablishing post-fire (FEIS pg. 321). Approximately 53 percent of the King Fire area burned at low to moderate severity (FEIS pg. 284). The natural succession of flowering shrubs, hardwoods, and perennial species would be wholly permitted across the majority of the fire area on Forest land where no treatments are proposed, and partially supported in dispersed mosaic patterns that are expected to result throughout treatment units where reforestation and release are proposed.

Kearns and Inouye (1997) discusses the composition, abundance and foraging behavior of insect flower visitor change with habitat fragmentation. Essentially changing the dynamics of population changes in pollinator abundance may affect the number of pollen grains deposed on flower stigmas. Post fire ground disturbance from logging and reforestation activities alter and fragment, reducing bee nest-sites and flowers. We acknowledge that bees could be affected by habitat alterations that fragment or reduce availability of flowers. Other effects of the project may decrease the number of abandoned pre-existing burrows that provide nest and hibernation sites for queens (FEIS pg. 322).

The Allee effect mentioned in the comment are “implications for the management of endangered plants, dependent on animal vectors for reproduction, which often are restricted to isolated, small populations, as well as suggesting a potential limit to spatial spread in plant populations dependent on animal vectors for reproduction” (Groom 1998). Essentially, the lack of reproductive opportunities can cause negative growth rates below critical density thresholds (Ibid). Please refer to the botany effects section for the discussion of special plant habitats and

special designation of botanical areas and the botanical affects from pre-post fire within the project (FEIS pgs. 63 to 85).

The May 19, 2015, the White House released of the National Strategy to Promote the Health of Honey Bees and Other Pollinators.

> "*The direction of the pollinator task force is to promote the health of honey bees and other managed bees, as well as wild bees. A critical component of the strategy is to advance the science underpinning the government's land management and regulatory decisions. Decisions on how to best manage lands are complex, driven not only by natural resources considerations, but by social and economic influences. Virtually every land management decision requires either implicit or explicit trade-offs among these elements. Support tools are needed to help decision-makers understand and forecast decisions that affect pollinators and to refine best management practices for implementation across landscape types*".

The Forest Service agrees that management activities should be aimed at improving diverse assemblages of primarily native flora and keeping undisturbed areas, such as logs and clumps of grass, constantly available throughout the year so bees can find nesting, foraging, and overwintering sites (Blake et al. 2011)(DEIS 3-269). The snag retention guiding principles and Design Criteria TW-5 was included to mitigate potential for project impacts to bees by maintaining herbaceous native plant cover during release treatments (DEIS 3-269). The Design Criteria TW-8 would reduce potential impacts to bumble bees by requiring the maintenance of at least 50 percent herbaceous native plant cover for pollinators during follow-up release treatments in conifer plantations (DEIS 3-270). The recommended design features to mitigate prescribed burning impacts to bees includes scheduling prescribed burns to avoid periods when bumble bees are active (from spring until autumn) and stagger burning treatments to ensure that some flowers are always available, and ensure that nesting habitat is in close proximity (500-800 m; 0.3-0.5 mi) to foraging habitat (FEIS pg. 322).

Habitat

245. Comment (Commenter 21): In the image below, taken on private lands outside the King Fire on Wentworth Springs Road near Georgetown, and within the Eldorado National Forest, the understory has been completely eliminated with herbicide and thinning has occurred but the trees are left on the ground creating a fire hazard. There is almost nothing here for wildlife. This has been a typical scene throughout the forest for decades.

Image above: Plantation adjacent to Eldorado National Forest on private industrial forest lands

This is obviously significant for iconic species like black-tailed deer. In the 1998 state-wide assessment of the perpetually declining status of deer herds in the state, it was found that "Declining abundance of early successional vegetation communities in forestland was considered to have the greatest effect on long-term deer populations. The primary mechanism to establish those communities is fire, either wildfire or prescribed" (CDFG 1998, p. 35, emphasis added). The DEIS failed to evaluate the impacts of the loss of early successional species upon the deer herds. Only the use of fire assures the maintenance of species through the natural ecological processes to which all the living things in the forest are evolutionarily adapted.

Response: The FEIS evaluated the impacts of the Project on mule deer (pg. 330). The 1998 state-wide assessment may be outdated, because over the past 17 years trends in fire size and severity have increased. There is likely to be more early seral conditions presently on the landscape given the shift in trends of fire size and severity. Large areas of the king fire are not proposed for treatment and as such will provide abundant early seral conditions for deer, more so then pre-fire. Additionally, the reforestation plan aims to maintain dispersed shrub cover in treatment areas. Private forest management has different objectives than Forest Service Management and especially in plantation management uses different methods to accomplish those objectives. Whereas the King Fire proposes to use glyphosate to treat shrubs to reduce the cover to less than 30 percent in treated areas for the next 10 years, private industrial forest land like that pictured above typically use a pre-emergent herbicide to eliminate all competing vegetation prior to planting resulting in a very different composition of vegetation than on National Forest System lands.

As seen in the photograph below of a plantation established after the 2001 Star Fire on the Georgetown Ranger District of the Eldorado National Forest, herbicide release with glyphosate during establishment can result in an assortment of shrubs and other vegetation growing between the planted conifer seedlings. This plantation is of a similar age to the plantation photographed on private land by the commenter.

Plantation established following the 1992 Cleveland Fire at 16 years old. Plantation was treated with herbicide for control of vegetative competition during establishment. Photo courtesy of Dana Walsh, Silviculturist on Eldorado National Forest, taken in 2008.

California Spotted Owl (CSO)

246. Comment (Commenter 21): None of the proposed action alternatives go far enough to minimize the effects of post-fire restoration activities on the California spotted owl and ensure species viability.

Response: The Responsible Official will consider your input and is considering all alternatives and their impacts equally. He will consider the Purpose and Need of the project, the most recent information and specialist reports, and input from interested parties in making his decision. Treatments have been reduced and/or mitigated in the post-fire territories to a point where it has been determined that the preferred alternative may affect individuals, but is not likely to result in a trend toward federal listing or loss of viability of California spotted owls in the planning area (see BE). In addition, modifications to an alternative by the Decision have been made to further reduce treatment effects within California spotted owl territories by reducing planned treatments within 0.7 miles of the territory center. In particular, within territories, salvage treatments were dropped from high severity burned forest that occurred within 500 feet of habitat that remained unburned or burned at less than 50 percent basal area mortality. These changes resulted in dropping approximately 630 treatment acres in spotted owl territories, further reducing the potential for project actions to impact California spotted owls as described in the King Fire Restoration Project Biological Evaluation.

247. Comment (Commenter 21): We cannot stress enough the level of concern we have for the California spotted owl on the Eldorado National Forest, a species that declined by as much as 61% since 1990 within the project area (Tempel et al. 2014) prior to the King Fire. There is no longer time to let politics, economic interests, or entrenched agency ideology result in further spotted owl declines on your forest. Spotted owls perpetually suffer from management decisions that attempt to “balance” economic interests with species viability and persistence, but these

attempts to balance competing interest almost always result in habitat degradation. The time is now to begin making decisions based on the precautionary principle for this imperiled raptor and to arrest the ongoing decline on your forest.

Response: The Forest Service is attempting to achieve multiple objectives through implementation of this project. One purpose and need of the project is to balance active management with the retention of important attributes of post-fire habitat at the landscape scale and within treatment areas to support the diversity and abundance of species (FEIS page 5). No treatment areas, snag/log retention, and limited operating periods described in the FEIS serve to reduce impacts to California spotted owls. The FEIS acknowledges that California spotted owls may use high-severity fire as foraging habitat, but the extent to which owls use severely burned forests is unclear, and there is no indication of owl dependency on burned forest conditions (pages 299 and 300). In response to these comments, an alternative was modified by the Decision to further reduce the potential for treatment effects within CSO territories. Salvage harvest was reduced within 0.7 miles of the territory center of a number of owl sites, focusing on territories that were found to be occupied in 2015. In addition, within owl territories, salvage harvest was dropped from burned forest that occurred within 500 feet of unburned or low severity burned habitat. The Responsible Official is aware there may be impacts to the owl as informed through the disclosure of potential effects in the FEIS, ROD, and BE.

The precautionary principle approach does not apply to risk management in the context of this project. Although the action may affect owls, there is not scientific consensus on the extent of owl use of severely burned forest. There is extensive scientific literature that concludes the owl is most dependent on the limited resource of high quality nesting and roosting habitat (old, multi-layered forests) and, in part, this project aims to reduce future fire risk to remaining nesting/roosting habitat. Although it is disputed, there is adequate evidence that reburn could result in loss of important remaining green forest (FEIS Chapter 3 pages 144 to 152). Risk of effects to owls from foraging habitat degradation is plausible, but protections such as no treatment areas, LOPs, and updated PAC delineations.

248. Comment (Commenter 21): Of the alternatives you propose, Alternative 3 would be least harmful to the California spotted owl. However, all of the action alternatives you propose will result in significant adverse effects to spotted owls, including Alternative 3. Therefore, to ensure species viability on the Eldorado National Forest, we believe it is necessary to further reduce the effects of Alternative 3 to this sensitive species.

The proposed conservation alternative includes significant modifications of Alternative 3 including, 1) increased protections for California Spotted owl, 2) a serious commitment to fire-landscape realignment that mimics the ecological fire regime and fire return intervals known to exist on the King Fire landscape, 3) a reforestation effort, where needed, that moves away from the limited concepts of variable density presented in the DEIS to a system of ecological "cluster" planting based on site conditions and PSW-GTR-220 principles, 4) reforestation efforts that value complex early seral forest conditions and which are coordinated with fire ecologists and fuels specialists to insure planting clusters and planting density support increased fire use, 5) limited to no use of herbicides for reforestation and control of native shrubs, 6) where reduced planting does occur clusters are well-tended to insure creation of first generation fire-recovery forests which become the seed-bearing trees that interact with future fire to provide the ecologically resilient forests of the future.

Response: An Alternative was developed for the FEIS (pg. 45 to 47) based on this comment.

249. Comment (Commenter 21): We thank you for providing the most objective and scientifically accurate NEPA analysis on the potential adverse effects of salvage logging and reforestation activities on the California spotted owl that we have reviewed to date.

Response: Thank you for your comment.

250. Comment (Commenter 21): Because spotted owls are known to select complex early seral forests for foraging (Bond et al. 2009), but are not known to select plantations for foraging, it is reasonable to infer that reforested areas will result in a long-term loss of foraging habitat, compared to the no action alternative. To illustrate this, below is Figure 3V.6 from the DEIS, which was included in the DEIS to demonstrate the results of industrial plantation forestry 50 years after planting on the Eldorado National Forest. Although it is possible to grow trees quickly with industrial forestry techniques, this forest stand is even-aged, with evenly spaced trees, lacks an understory shrub component, and has no large downed woody debris or snags; this forest stand lacks almost all of the important habitat attributes used by spotted owls. Finally, in the SFMZ, you propose to plant trees at densities that will create a shaded fuel break when mature, similar to the stand structure in photograph below. Again, these are forest conditions that do not support viable spotted owl populations and thus should be considered a permanent loss of habitat.

Image above: Plantation established after the Ice House Fire and managed with herbicide, and pre-commercial and commercial thinning (p. 3-159 DEIS)

Response: The plantation pictured is the result of active management that was intended to maintain future options in these stands. It was planted at a high density and was thinned both pre-commercially and commercially based on the objectives at that time. The picture does not represent the desired or expected outcomes of reforestation in the King Fire Restoration project, where greater heterogeneity is being incorporated into planting prescriptions. The stand was

proposed for thinning based on more ecological principals in 2009, and stands such as these retain management options, such as thinning which could be done to increase heterogeneity and to initiate additional age classes. A stand dominated by small trees and occupied by dense shrubs does not quickly develop large trees, snags or down logs.

The FEIS (pg. 288) describes that a more rapid rate of reforestation and development of large trees through conifer planting could benefit landscape heterogeneity and wildlife habitats in the portion of the landscape that burned in the large high-severity patches outside the NRV. The FEIS also describes, however, that there is scientific debate regarding post-fire reforestation for establishment of old forest habitat, as some scientists argue that the delay in the restoration of old forest habitat (especially large trees) in large fire areas is detrimental for wildlife (Sessions et al. 2004); but others contend that salvage and replanting disrupts an important seral stage and recovery process that favor other wildlife species (Hutto 2006, DellaSala et al. 2014). Despite this debate, planting and release treatments that are limited in their extent and spatially heterogeneous at both stand and landscape scales are more likely to maximize benefits for wildlife compared with those that are not (Campos and Burnett 2014), and smaller, discontinuous planted areas may best support future heterogeneity (FEIS page 286).

The cluster planting reforestation strategy (as described in Chapter 2 pages 15 to 18) following salvage is expected to develop into atypical variable density forests, not industrial plantations. Because cluster planting is a new strategy with limited use by the Forest Service, there are currently no examples where management of cluster planting is old enough to show stand structure several decades in the future with effective management. Within units proposed for reforestation/release, snag retention patches covering 10 percent of the unit, along with other areas avoided during site preparation would not be reforested. This would leave a mixture of planted and unplanted areas. Follow-up inter-planting from mortality (FEIS page 17) would further create conditions that promote a variable forest structure with openings and shrub patches both within and between reforested areas. In the approximately 572 acres of RCAs, and in other areas where manual release to reduce shrub competition is restricted to hand treatment in the immediate proximity of the planted seedlings, stands are expected to have a notable shrub component in the understory. (DEIS Chapter 3, page 208)

251. Comment (Commenter 21): Clark et al. (2012) found that salvage logging interacts with the effects of high severity fire to increase the probability of loss of occupancy and extinction; as such, in the aftermath of a high severity wildfire, the only variable managers have control over to minimize the interactive effect of these two disturbances on spotted owls is to minimize or avoid salvage logging in territories. A primary difference between salvage logging and even-aged management is salvage logging interacts with the effects of wildfire and spotted owls affected by fire are subjected to a second ecological disturbance even within a relatively short period of time (1-2 years). Therefore, we assume that the threshold at which the amount of post-fire salvage logging would result in territory abandonment or reduced reproductive success would be lower than green tree logging.

We request the Eldorado National Forest document the need for short and longer term persistence of spotted owls even in landscapes the Forest Service may believe no longer valuable to owls in post-high severity fire. The Forest Service's evaluation of owl's currently using burned forests subjected to salvage logging in nesting, roosting, and foraging habitat disregards the immediate risks to the population on the Eldorado National Forest and is not consistent with law, policy and regulations.

Response: The Forest Service agrees with the concern over both short and longer term persistence of spotted owls within and surrounding the King Fire Restoration project area and has an identified purpose of balancing active management with the retention of important attributes of post-fire habitat at the landscape scale and within treatment areas to support the diversity and abundance of species (FEIS, page xii and pg. 5). While interactive effects of fire and salvage logging are possible, effects described in Clark et al. (2012) are not definitively attributed to either fire or to both fire and logging. In fact, the comparison of effects from salvage logging versus solely fire was not sufficiently robust to demonstrate an interactive effect. Spotted owl PACs and territories subjected to high proportions of high-severity fire were found unoccupied in 2015 surveys, confirming the results of the PAC habitat evaluation described in the DEIS (Chapter 3, page 299 to 300). After a stand-replacing event, habitat conditions are evaluated and if there is insufficient suitable habitat for designating a PAC, the PAC may be removed from the network (SNFPA ROD page 37). PACs that remain intact or have been remapped will have an LOP, minimizing the likelihood of noise or activity disturbance resulting in territory abandonment or reduced reproductive success has been mitigated.

The FEIS explained short and long-term direct, indirect, and cumulative effects to California spotted owls (Chapter 3 page 302 to 309) and documented the need for persistence of spotted owls Chapter 2 page 2)"The probability of California spotted owl (CSO) persistence within and adjacent to the King Fire… were evaluated in project development. In particular, where post-fire persistence of a spotted owl territory was expected, salvage harvest within 0.7 mile of the territory center was not proposed except for the purpose of hazard reduction or establishment of strategic fire management zones." Delineation of new or additional PACs where new territorial owls are detected (FEIS Appendix E, page 1) is an ongoing process that will continue as forest conditions return following high-severity fire. The FEIS (page 303) describes the effects salvage logging may have on future habitat development. Few large snags may be expected to remain intact for sufficient time to provide future nest structures in areas affected by high-severity fire. However, removal of snags will reduce longer-term recruitment of down logs over subsequent decades, and the pulse of standing and down wood produced by high-severity fires may be an important contribution to future habitat as it will be the only contribution of large woody debris in stands for many decades (FEIS page 303). As forest conditions develop within the King Fire area, the Forest Service will manage landscapes for the persistence of spotted owls in areas previously affected by high-severity fire.

The BE accounts for 2015 survey data identifying occupied sites and mapping the best 300 acres of nesting and roosting habitat as a PAC. This habitat will not be altered by treatments other than roadside hazard abatement. To further reduce alteration of potential foraging habitat, an alternative as modified by the Decision will eliminate treatments within 500 feet of low severity burned habitat in post-fire owl territories. This change was made to maximize foraging opportunities in habitats along the edge of high-severity burned forest. The potential for impacts to California spotted owls in the area of the King fire from project implementation have been disclosed in the FEIS and Terrestrial Wildlife BE and are reduced through no treatment areas, LOPs and snag retention in treatment units and riparian conservation area buffers.

252. Comment (Commenter 21): The majority of the effects to spotted owls that occur under Alternative 3 are the result of roadside hazard tree removal and the SFMZ. Although it is entirely possible that additional territories will be determined to be occupied by the time protocol surveys are completed over the coming months, the occupancy rate in the King Fire is troublingly low. Such a low occupancy rate suggests the immediate direct effects of the King Fire to the spotted owl population were severe and/or the effects of salvage logging on adjacent private lands over

the past 7 months has caused large numbers of territories to be abandoned. Regardless of the cause, such a low occupancy rate makes it all the more important that you maximize the protections you offer to the few territories that remain occupied, otherwise species viability and persistence on your forest would certainly be compromised, exacerbating the already significant trend toward federal listing.

Response: The potential effects of treatments are reduced through incorporation of design criteria (FEIS pages 28-37) and an alternative as modified by the Decision by eliminating treatments within 500 feet of low severity burned habitat in post-fire owl territories. This change was made to maximize foraging opportunities in habitats along the edge of high-severity burned forest, where some studies indicate use of high severity fire may be greatest (Comfort 2013, Eyes 2014). The potential for impacts to California spotted owls in the area of the King fire from project implementation have been disclosed in the FEIS and Terrestrial Wildlife BE and are reduced through no treatment areas, LOPs and snag retention in treatment units and riparian conservation area buffers.

Comfort, E. 2013. Trade-offs Between Management for Fire Risk Reduction and Northern Spotted Owl Habitat Protection in the Dry Conifer Forests of Southern Oregon. PhD Dissertation submitted to Oregon State University.

Eyes, S.A. 2014. The Effects of Fire Severity on California Spotted Owl Habitat Use Patterns. M.S. Thesis, Humboldt State University.

253. Comment (Commenter 21): To further minimize the effects of Alternative 3 to spotted owls and ensure species viability, we ask that you:

(1) Avoid all salvage logging and biomass removal within all occupied territories, except for hazard tree removal associated with level 3 and 4 roads and salvage logging and biomass removal in the WUI.
(2) Avoid applying herbicides to control native vegetation within occupied territories.
(3) Avoid planting trees at densities that will result in even-aged stands when desired stocking levels are reached.
(4) Avoid hazard tree removal associated with level 2 roads in occupied territories.
(5) Avoid salvage and biomass removal in all pre-fire PACs and pre-fire nesting and roosting habitat within 0.7 mile of an activity center, except for hazard tree removal on level 3 and 4 roads and salvage and biomass removal within the WUI.
(6) Avoid salvage and biomass removal in all low and moderate severity burned forest within 0.7 mile of a spotted owl activity center, except for hazard tree removal on level 3 and 4 roads and salvage and biomass removal within the WUI.

Response: An alternative was developed for the FEIS (pg. 45 to 47) based this comment.

254. Comment (Commenter 21): Based on the long-term and significant spotted owl declines that occurred on your forest prior to the King Fire, the effects that the King Fire and/or salvage logging on private lands has had on the occupancy rate of a large number of spotted owls on your forest, and the potential effects of the proposed action alternatives on the few remaining occupied territories within the project area triggers a significant change in direction in the King Fire DEIS.

Response: An alternative was developed for the FEIS based on this and other comments received. See Comment 253.

Policy

255. Comment (Commenter 21): Draft Interim Recommendations (IRs) for the California spotted owl, developed a few months ago by Forest Service scientists with the Pacific Southwest Research Station, suggest that no salvage logging should occur within pre-fire PAC acres and no salvage logging should occur within forests that did not burn at high severity. In addition, the IRs call for maintaining 700 acres of foraging habitat within territories. In the absence of final IRs, we suggest you consider following the recommendations in the draft IRs.

Response: Scoping and Alternative development for the King Fire Restoration project occurred prior to issuance of the Draft Interim Recommendations on August 20, 2015, and the draft IRs are therefore not applicable to this project (Regional Forester memo date 8/20/2015). An alternative was developed that would exclude all pre-fire PACs from salvage treatments and which would not salvage log in low and moderately burned areas of the fire. Alternative 3 of the FEIS eliminated salvage logging in forests that did not burn at high severity.

256. Comment (Commenter 21): We would like to emphasize that several listed species occur within the action area that may be affected by project related activities, including the California red-legged frog, Sierra Nevada yellow-legged frog, and valley elderberry longhorn beetle. No project related activities that may affect listed species should commence until you have completed section seven consultation with Fish and Wildlife Service. Once you have completed section seven consultation, we ask that you post a signed copy of the resulting biological opinion or letter from Fish and Wildlife Service concurring the proposed project is not likely to adversely affect any listed species on the King Fire project page of website.

Response: The FEIS contains an analysis of effects for the California red-legged frog (Federally threatened) [pgs. 248, 249, and 263 to 267], Sierra Nevada yellow-legged frog (Federally endangered) [pgs. 249, 250, and 267 to 271], and Valley elderberry longhorn beetle (Federally threatened) [pgs. 293 to 294].

A Biological Assessment (BA) has been prepared and determined to be "not likely to adversely affect the California red-legged frog", "likely to adversely affect" the Sierra Nevada yellow-legged frog, and "no effect" to Valley elderberry longhorn beetle. The BA was submitted to the U.S. Fish and Wildlife Service (USFWS) requesting formal consultation and the issuance of a Biological Opinion for the Sierra Nevada yellow-legged frog, and concurrence with the finding that the project is not likely to adversely affect the California red-legged frog.

The issuance of a Biological Opinion and concurrence with the USFWS is required before activities within suitable habitat of the California red-legged from and Sierra Nevada yellow-legged frog could be implemented (BA, pg. 15, 19, 20, and 23). Project activities that occur outside of suitable habitat may be implemented without formal consultation with the USFWS. The concurrence with USFWS, including the Biological Opinion will be made available as part of the project record.

Other

257. Comment (Commenter 21): The DEIS includes several design features that represent small positive steps toward an ecologically sound post-fire recovery strategy; however, in general, we found that the action alternatives do not go nearly far enough to move past the utilitarian-focused post-fire forest management practices that have dominated Forest Service ideology in the Sierra Nevada.

Response: Design features to address post-fire recovery were included in the FEIS (pages 9 to 11 and Table 2.15). This project is using the latest research and contemporary practices in managing for desired future condition, developing the purpose and need, and developing the proposed action. For example, resilience, restoration, fuels, wildfire and natural range of variability aspects of forest ecology and management were reviewed specifically for this project (FEIS Vol. 2 Appendix A, B, and C), which informed planning of recovery, reforestation, and restoration activities within the area (FEIS Vol. 2 Appendix B page 2). The "Science synthesis to support socioecological resilience in the Sierra Nevada and southern Cascade Range" (Long and other 2014) was also used. Additional design features have been added into the in the FEIS.

258. Comment (Commenter 21): Direct, Indirect and Cumulative Impacts associated with Cattle Grazing to Sensitive Plants, Recovering Riparian and Meadow Vegetation, Soils, Water Quality and Sensitive Wildlife Species Were Not Analyzed in the DEIS, Contrary to NEPA 40 CFR § 1502.15; §1502.16.

There has been active cattle grazing allotments in the King Fire perimeter for many decades. However, the DEIS made no mention of retiring allotments or extended "resting" of the existing grazing permits until recovery of resource conditions that support desired conditions and ecosystem integrity occur. This should be the case.

We are concerned that at DEIS 2-27, Table 2.15 Summary of Design Criteria related to the federally listed California red-legged frog is a section RR-1 and RR-2 requiring range staff to contact permittees annually regarding range improvements and maintenance. This leads us to assume that there will be active grazing, immediately, in the post-fire environment. This permitted activity is potentially harmful to sensitive habitats and species, soils and water quality in the post-fire environment. In part, grazing impacts are magnified since cattle occupying the hot, dry landscape post-fire will be even more likely to concentrate in cooler, moist areas. These areas are the most sensitive part of the burned landscape. Further, cattle grazing will exacerbate the proliferation of non-native invasive weed species. Many species of native plants will be replenished through the action of fire, and it is important for their long-term survival that seed production is maximized during the first few years to decades, until canopy closure of the emerging conifer sere or vegetation layer begins to shade them out. Livestock grazing, like plantation forestry, eliminates or truncates these natural successional processes that are essential to the viability of populations of early successional forest plants and wildlife.

We see no reference in the King Fire DEIS to impacts from cattle grazing on sensitive plants, recovering riparian and meadow vegetation and habitat, aspen stands, seeps and springs, sensitive wildlife species, and proliferation of invasive weed species. This lack of disclosure is contrary to NEPA's requirements to disclose potential impacts to national forest resources. One solution would be to require full rest of all allotments in the burn perimeter for 5 years or at such time when resources specialist agree that monitored grazing can proceed with appropriate mitigation measures in place to aid natural resource recovery. Concentrated cattle use adjacent to aquatic resources also poses a public health risk that should not be ignored. See: http://www.hindawi.com/journals/jeph/2012/760108/

Response: Livestock grazing was not analyzed in the DEIS or FEIS because it is outside the scope of the proposed action. Livestock grazing in the King Fire would occur were consistent with existing Allotment Management Plans (AMP) and the associated NEPA analysis and decisions.

The King Fire burned a large portion (54%) of the Old Pino Allotment and a small area (9%) of the Chipmunk Allotment. Cattle grazing was authorized on these allotments for the 2015 season, in portions of the allotments outside of the fire perimeter and adjacent areas inside the fire perimeter of unburned or low burn severity that did not have changed conditions (conditions are similar to those prior to the fire and analyzed for livestock management in the current AMPs), where range readiness conditions were met, and where grazing could occur while meeting desired conditions [as defined in the AMPs and Eldorado National Forest Land and Resource Management Plan (LRMP)]and without unanalyzed resource impacts. Conditions considered to determine if grazing could occur within the fire perimeter included a reasonable likelihood (similar level to pre-fire) that LRMP Standards and Guidelines (S&G) could be met, that resource recovery in the fire area would not be adversely impacted, and that livestock could be contained within the area determined ready for grazing. Allowable numbers were reduced by 70% on the Old Pino Allotment for the 2015 season and authorization to operate is contingent upon the permittees ability to keep livestock outside of burned areas on NFS that have changed conditions. Per the current AMP, resource specialist will be consulted and similar criteria will be used to determine if grazing will be authorized in subsequent years and the appropriate mitigation measures.

Invasive plant prevention management standards are included in the AMPs and additional prevention measures were included in the 2015 Annual Operating Instructions due to the increased risk of spread and introduction of invasive plants associated with the King Fire.

The FEIS Table 2.15 (pg. 35), RR-1 is design criteria to assure ongoing communication between the range program and other program areas that may implement projects, and RR-2 is design criteria for the protection of government owned range infrastructure if projects are implemented in the future. These design criteria do not address if or when project activities or grazing would be authorized.

The journal article at http://www.hindawi.com/journals/jeph/2012/760108/ regarding water quality in cattle grazed areas in alpine watersheds was reviewed. The potential effect of livestock grazing on water quality was considered in the development and analysis of the existing AMPs, which include Range Best Management Practices (BMPs) to meet the desired conditions for water quality in the LRMP. All livestock grazing on the Old Pino and Chipmunk Allotments is consistent with existing AMPs and the associated NEPA analysis and decisions.

259. Comment (Commenter 21): Research Natural Area Peavine Point

Page 3-281, analysis of effects to the Peavine RNA (the proper name of the RNA is Peavine Point), suggests that not only logging but planting and unnamed other activities are proposed to occur in the RNA. It proposes logging 23 to 30 acres of trees, depending upon the alternative, and "Direct effects would be removing trees, planting, and mechanical treatments…In all alternatives, mechanical treatment would remove conifers in CWHR Size Class 4 and 5 in the RNA, particularly as they are found along roadsides."

These activities are not permitted under the direction of the FS Manual, see Ch. 4063.34 Research Natural Areas which states:

"Use only tried and reliable vegetation management techniques and then apply them only where the vegetative type would be lost or degraded without management. The criterion is that management practices must provide a closer approximation of the naturally occurring vegetation and the natural processes governing the vegetation than would be possible without management."

"The Station Director, with the concurrence of the Forest Supervisor, may authorize management practices that are necessary for invasive weed control or to preserve the vegetation for which the Research Natural Area was created (FSM 4063.3). These practices may include grazing, control of excessive animal populations, or prescribed burning. Take extra care to protect undisturbed ecological climax conditions, such as old-growth forests" (emphasis added)."

Response: The commenter is correct that fuels reduction and hazard tree removal activities are proposed within the RNA. The treatments that are being proposed within the RNA include mechanical tree removal in a portion of Wildland Urban Interface that is adjacent to residences, fuel reductions to facilitate fire management for wildfire and prescribed fire use within the RNA, and reduction of roadside hazards on Roads open to public use. Reforestation activities are not proposed within the boundary of the RNA.

Treatments proposed within the Peavine Point RNA (Peavine RNA in the ENF LRMP) are under consideration by the RNA committee and would be approved by the Station Director prior to implementation, consistent with Forest Service direction. The Peavine Point RNA Management Plan (2/9/98) (p. 7) identifies the removal of hazard trees adjacent to the road as a permitted action. The Management Plan further recognizes that maintenance of the road is critical to providing fire protection and management of the RNA.

Commenter 1 – Response to Comments

260. Comment (Commenter 1): Request for changes to be made to the final NEPA document: In the new NEPA document indicate in an easy to notice location in the Proposed Action description that "no glyphosate-containing herbicides will be applied." OR Indicate noxious weeds will be addressed using mechanical and biological means (instead of herbicides) in spite of the higher cost. Issue #21 ----- Federal officials who knowingly take action that will place public health and safety in jeopardy by "concealing" important information violate 18 U.S.C. § 1001 and are thus subject to up to 8 years in prison.

Response: The Forest Service proposes the use of herbicides in addition to other vegetation treatments that use manual and mechanical methods to support reforestation efforts. Herbicides are needed where manual and mechanical methods are insufficient to control target species for initial survival and future resilience. The proposed methods would be prescribed with consideration for target species, use site, and other environmental constraints set forth in the Environmental Impact Statement. Where glyphosate is appropriate, it will be recommended.

The commenter asserts that Forest Service employees are knowingly concealing information. Regulations from the Council on Environmental Quality (CEQ) direct agencies to "insure the professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements" (Section 1502.24). No members of the ID Team have criminally hidden or falsified information for this analysis. The Forest Service follows all applicable pesticide laws and regulations.

261. Comment (Commenter 1): USFS line-officers are responsible for protecting the public during their national forest visits. Here's an example of glyphosate safety science reported on April 26, 2015 reported in *Health Impacts News*:
http://healthimpactnews.com/2015/more-evidence-that-herbicide-glyphosate-causes-cancer/
Here's an article published on March 20, 2015 by the Reuters news agency:

http://www.reuters.com/article/2015/03/20/us-monsanto-roundup-cancer-idUSKBN0MG2NY20150320

Colombia Bans Glyphosate from Being Sprayed on Coca (Cocaine) Crops, while the U.S. has no restrictions. Read more at:
http://naturalsociety.com/columbia-bans-glyphosate-from-being-sprayed-on-coca-cocaine-crops/

In 2014 the Monsanto corporation had a revenue if 15.9 billion dollars. Their lobbying budget was 3.9 million dollars. Don't you think they might have a little pull with 3rd party safety testing labs they hire that conclude "glyphosate is safe enough to drink"?

Glyphosate is a toxic poison and must never be applied to public land where families recreate. Incredibly you propose to apply this poison to vegetation growing on land owned by and used by 317 million Americans.

As a retired USFS employee I understand that natural vegetation and the resources that depend on the health of the natural vegetation will be significantly harmed if the non-native invasive plants are not eradicated. I also know there are effective (although more costly) alternatives to killing these plants other than herbicides. If most Americans knew of the tragic results stemming from contact with some herbicides they would insist that the USFS spend the extra money on these safer alternatives. There is information widely available that discusses the dangers and toxicity of some herbicide products sold over-the-counter in America. As you will learn below, other countries protect their citizens by taking the vast amount of scientific information seriously.

If these products (in this case herbicides) provide profit for the corporation that manufactures the product, the corporation will stop at nothing to prove their product is safe. Incredibly, some government regulatory agencies (FDA, EPA etc.) choose to look the other way when confronted by these dangers. This is the case with Monsanto and their herbicides that contain glyphosate. There are scores of brand names for herbicides that contain glyphosate. Roundup is the most popular.

Indeed, there is a reason the United States is currently having a cancer epidemic much worse than other industrialized countries. Source: http://www.sehn.org/ppfaqs.html

Even casual exposure to herbicides that contain glyphosate is shown in the lab to cause cancer in mammals. Of course now you are wondering what you can do to disprove these science conclusions. You might not even believe that glyphosate is unsafe. I suggest you search the WEB for the 2 words "glyphosate" and "cancer." When you do you will get 79,600 hits. They can be a\read at:
http://www.bing.com/search?q=glyphosate+cancer&qs=n&form=QBLH&pq=glyphosate+cancer&sc=2-17&sp=-1&sk=&cvid=a9a7e18786764443aa59079d8144f559

Please don't tell the public everything will be fine since you plan to apply the herbicide according to label directions. Monsanto would not dare to say anything that might indicate to the public there are health issues associated with their products. The label directions must not be trusted. Monsanto pays other chemical labs to do the safety research on their glyphosate-containing herbicides. These labs know what Monsanto wants. The label directions printed and composed by Monsanto are based on this type of so-called safety evaluation. It should not be necessary to explain further. Attachment 9a contains statements by hundreds of well-respected Ph.D. scientists who describe their research findings on the safety of herbicides containing glyphosate. Their

research indicates glyphosate containing herbicides clearly kill fish at very small concentrations and may be linked to the following health problems in mammals (including humans): birth defects, non-Hodgkin's lymphoma (a form of cancer), mitochondrial damage, cell asphyxia, miscarriages, attention deficit disorder, endocrine disruption, DNA damage, skin tumors, thyroid damage, hairy cell leukemia (another cancer), Parkinson disease, premature births, decrease in the sperm count, harm to the immune system in fish death of liver cells, severe reproductive system disruptions and chromosomal damage. "The establishment of the WHO's Acceptable Daily Intake (ADI) is based on limited studies using limited parameters which do not account for vulnerable groups such as children, the elderly, the sick and other groups that might have increased susceptibility to glyphosate exposure."

Concerns Over Glyphosate Use
The Sun (Malaysia), Friday August 20, 1999
http://www.poptel.org.uk/panap/archives/glywb.htm

Would the *Journal of Environmental Research and Public Health* have reason to publish a story that is not true?

"Abstract: The current chronic kidney disease epidemic, the major health issue in the rice paddy farming areas in Sri Lanka has been the subject of many scientific and political debates over the last decade. Although there is no agreement among scientists about the etiology of the disease, a majority of them has concluded that this is a toxic nephropathy. None of the hypotheses put forward so far could explain coherently the totality of clinical, biochemical, histopathological findings, and the unique geographical distribution of the disease and its appearance in the mid-1990s. A strong association between the consumption of hard water and the occurrence of this special kidney disease has been observed, but the relationship has not been explained consistently. Here, we have hypothesized the association of using glyphosate, the most widely used herbicide in the disease endemic area and its unique metal chelating properties. The possible role played by glyphosate-metal complexes in this epidemic has not been given any serious consideration by investigators for the last two decades. Furthermore, it may explain similar kidney disease epidemics observed in Andra Pradesh (India) and Central America. Although glyphosate alone does not cause an epidemic of chronic kidney disease, it seems to have acquired the ability to destroy the renal tissues of thousands of farmers when it forms complexes with a localized geo environmental factor (hardness) and nephrotoxic metals."

Monsanto's Roundup linked to fatal, chronic kidney disease
February 2014 issue
Link: http://www.mdpi.com/1660-4601/11/2/2125

Would the International Agency for Research on Cancer have reason to publish a story that is not true?

"Analyzing 44 individual research projects published since 1980, the scientists, writing in the International Journal of Environmental Research and Public Health, said that people exposed to the weed killer glyphosate, marked by Monsanto under the brand name Roundup, had double the risk of developing non-Hodgkin's lymphoma."

Study: Glyphosate Doubles Risk of Lymphoma
By Emily Cassidy, Biofuels Research Analyst
AgMag BLOG, May 23, 2014
Link: http://www.ewg.org/agmag/2014/05/study-glyphosate-doubles-risk-lymphoma

Would the USGS have reason to publish a false report in *Environmental Toxicology and Chemistry*? Monsanto"s Roundup persists in soil and water, February 2014 issue
Link: https://www.ncbi.nlm.nih.gov/pubmed/24549493

If you believe the outdated, biased USFS sources that show herbicides containing glyphosate are safe you will live the rest of you life wondering. Any reasonable, thinking, ethical person with this knowledge would deal with noxious weeds with the slightly more expensive alternatives to chemicals.

The USFS has no mandate to prop-up Monsanto does it? Here's more:

Glyphosate -Human Health and Ecological Risk Assessment Final Report
http://www.klamathforestalliance.org/Documents/glyphosate.pdf

"Striking increases in the incidence of non-Hodgkin lymphoma cancer have occurred over the past 30 years. A 2014 systematic review and meta-analysis of epidemology studies broke down the relationship between non-Hodgkin lymphoma and occupational exposure to agricultural pesticides by group and by active ingredient. Among the findings — a handful of those studies identified a positive association between glyphosate and B cell lymphoma (a type of non-Hodgkin lymphoma). Given the information gaps in the chemical registration process (considerations of endocrine disruption in risk assessment, anyone?) and the fact that we know it can take years for science to catch up with pesticide effects, even pesticides like glyphosate that are described as "less toxic" should still raise big questions and be closely tracked."

"Roundup Ready" nears the end of the line
By Emily Marquez
GroundTruth, July 7, 2014
Link: http://www.panna.org/blog/roundup-ready-nears-end-line

"Monsanto's herbicide Roundup has been linked to a mysterious fatal kidney disease epidemic that has appeared in Central America, Sri Lanka and India."

"We know that political changes in Sri Lanka in the late 1970s led to the introduction of agrochemicals, especially in rice farming. The researchers looked for likely suspects. Everything pointed to glyphosate. This herbicide is used in abundance in Sri Lanka. Earlier studies had shown that once glyphosate binds with metals, the glyphosate-metal complex can last for decades in the soil.

Glyphosate was not originally designed for use as an herbicide. Patented by the Stauffer Chemical Company in 1964, it was introduced as a chelating agent. It avidly binds to metals. Glyphosate was first used as a descaling agent to clean out mineral deposits from the pipes in boilers and other hot water systems.

It is this chelating property that allows glyphosate to form complexes with the arsenic, cadmium and other heavy metals found in the groundwater and soil in Central America, India and Sri Lanka. The glyphosate-heavy metal complex can enter the human body in a variety of ways. The complex can be ingested, inhaled or absorbed through the skin. Glyphosate acts like a Trojan horse, allowing the bound heavy metal to avoid detection by the liver, since the glyphosate occupies the binding sites that the liver would normally latch onto. The glyphosate-heavy metal complex reaches the kidney tubules, where the high acidity allows the metal to break free of the glyphosate. The cadmium or arsenic then damages the kidney tubules and other parts of the kidneys, ultimately resulting in kidney failure and, most often, death."

"Monsanto's Herbicide Linked to Fatal Kidney Disease Epidemic: Could It Topple the Company?"

By Jeff Ritterman, M.D.
Truthout, July 10, 2014
Link: http://www.truth-out.org/news/item/24876-monsantos-herbicide-linked-to-fatal-kidney-disease-epidemic-will-ckdu-topple-monsanto

High school students know the truth, yet USFS goon look the other way:
http://www.k12science.missouristate.edu/Junior_Academy/MJAS%20Docs/State%202009/Papers%202009/HS_ENV/Foulk_Kayla_HS.pdf

Are you still sure of yourself? Read:
http://www.greenmedinfo.com/blog/surprise-monsanto-funded-research-finds-their-products-safe
http://kettlerange.org/weeds/Chapter-3.html
http://www.boulderweekly.com/article-12640-muzzled-by-monsanto.html
http://www.ringoffireradio.com/2013/12/monsanto-wins-journal-retracts-study-citing-dangers-gm-corn-roundup/
http://www.panna.org/blog/roundup-cancer-future-food?utm_source=groundtruth&utm_medium=alert&utm_campaign=gt-04-16

Most of the human and non-human animal deaths caused by glyphosate exposure will be cancer-related. I suggest you read 18 U.S.C. § 1001 and the Administrative Procedures Act. The courts are aware of the USDA illegal herbicide use. Please see the sample of court cases below. Ignoring this clear evidence violates the APA.

In *Californians for Alternatives to Toxics, et al. v. Michael Dombeck*, Civ. S-00-2016 LKK/JFM (2001), Judge Lawrence Karleton presiding in the United States District Court for the Eastern District of California made the following findings:

"The Forest Service cannot proceed with the plan until it assesses how use of the herbicides would affect the spread of noxious weeds and considers new information that calls into question earlier Forest Service findings that use of the herbicides would not harm humans and wildlife."

Can you now understand that the evidence overwhelmingly indicates glyphosate is a potent carcinogen. There are thousands of sites on the WEB that clearly indicate glyphosate is potentially lethal. Incredibly, you depend on a single document endorsed by the USDA declaring that glyphosate is safe.

There are alternatives to herbicides. Spend a little more money using mechanical and/or biological control. I guarantee you will sleep better … especially when you think of kids. Glyphosate is driving the Monarch butterfly species to extinction>
https://mail.google.com/mail/?shva=1#inbox/148043eb3ca4fb6b

Please don't do something tragic just because the USFS says you can. It's time for independent thinking isn't it? Monsanto spends millions $$ each year on their ongoing PR campaign. Don't believe it. Please familiarize yourself with 18 U.S.C. § 1001 quoted below:

(a) Except as otherwise provided in this section, whoever, in any matter within the jurisdiction of the executive, legislative, or judicial branch of the Government of the United States, knowingly and willfully –

(1) falsifies, conceals, or covers up by any trick, scheme, or device a material fact;
(2) makes any materially false, fictitious, or fraudulent statement or representation; or

(3) makes or uses any false writing or document knowing the same to contain any materially false, fictitious, or fraudulent statement or entry; shall be fined under this title, imprisoned not more than 5 years or, if the offense involves international or domestic terrorism (as defined in section 2331), imprisoned not more than 8 years, or both. If the matter relates to an offense under chapter 109A, 109B, 110, or 117, or section 1591, then the term of imprisonment imposed under this section shall be not more than 8 years.

(b) Subsection (a) does not apply to a party to a judicial proceeding, or that party's counsel, for statements, representations, writings or documents submitted by such party or counsel to a judge or magistrate in that proceeding.

(c) With respect to any matter within the jurisdiction of the legislative branch, subsection (a) shall apply only to –

(1) administrative matters, including a claim for payment, a matter related to the procurement of property or services, personnel or employment practices, or support services, or a document required by law, rule, or regulation to be submitted to the Congress or any office or officer within the legislative branch; or

(2) any investigation or review, conducted pursuant to the authority of any committee, subcommittee, commission or office of the Congress, consistent with applicable rules of the House or Senate. - See more at:
http://codes.lp.findlaw.com/uscode/18/I/47/1001#sthash.ChXNLypx.dpuf

You are not exempt from the provisions of the Administrative Procedures Act. Under the APA, a court may set aside an agency action if the court determines that the action is "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. § 706(2)(A); *see also Marsh*, 490 U.S. at 375-77 (arbitrary and capricious standard applies to agency findings which involve agency expertise). Here's an excerpt from this opinion:

"Consequently, we may reverse the decision as arbitrary or capricious only if the agency relied on factors Congress did not intend it to consider, entirely failed to consider an important aspect of the problem, offered an explanation that ran counter to the evidence before the agency, or offered one that is so implausible that it could not be ascribed to a difference in view or the product of agency expertise."

Source: *SIERRA CLUB v. BOSWORTH*. An Appeal to 9th Circuit from the United States District Court for the Eastern District of California, Filed December 5, 2007
http://caselaw.findlaw.com/us-9th-circuit/1175742.html

Final Herbicide Comment: This is not a trivial issue. You will be making a life or death decision. The increase in non-native vegetation is a major problem throughout America … public and private land. Action must be taken to kill these plants and stop the spread. You cite a single out of date papers that concludes glyphosate is safe if it's applied according to label directions:

"(SERA 1997; SERA 2011; USDA Forest Service 2000; USDA Forest Service 2002 [updated 2007]; and USDA Forest Service 2003)." (page 3-112)

I have identified the following recent science with links to each document. They all conclude glyphosate is likely or probably carcinogenic to humans.

April 26, 2015 report in *Health Impacts News*
March 20, 2015 article by the Reuters news agency discussing the research findings of the World Health Organization cancer arm, the International Agency for Research on Cancer (IARC).

Articles discussing why glyphosate is banned for application in Denmark, England, Italy, El Salvador and Sri Lanka.
April 2013 issue of *Entropy* magazine
Sept. 5, 2002 issue of *Rachel's Environment and Health News*
February 2014 issue of *Journal of Environmental Research and Public Health*
May 23, 2014 issue of the Environmental Working Group publication
June 2014 National Center for Biotechnology Information, U.S. National Library of Medicine publication
A July 10, 2014 issue of *Truthout* written by Jeff Ritterman M.D
May 11, 2012 *GreenMedInfo* article titled "Monsanto-Funded "Research" Reveals Monsanto Products Are Safe."
April 3, 2014 issue of *Boulder Weekly* discussing the glyphosate research done by Vicki Vance, a professor at the University of South Carolina.
Gilles-Eric Seralini
Apr 16, 2015 issue of *Groundtruth* discussing the health impacts associated with exposure to glyphosate or RoundUp

There are alternatives to herbicides and there are herbicides besides glyphosate that are effective. The evidence is compelling. No intelligent, caring person would risk causing someone's death by applying glyphosate.

Response: The USFS human health and ecological risk assessment for glyphosate (SERA 2011), includes a lengthy discussion of the carcinogenic potential of glyphosate (Section 3.1.10) which was incorporated into the King Fire Restoration Project by reference. The project specific risk assessment characterizes risk to the general public, including scenarios involving children to identify risks associated with the project to inform the decision, and to identify where design criteria may be warranted to minimize risk.

Recently, the International Agency for Research on Cancer (IARC) Monograph Working Group determined that glyphosate should be classified as "probably carcinogenic to humans" (Guyton et al 2015). This recent decision was based on a review of existing studies and not on new research. The issue is a particular group of cancers called non-Hodgkin's lymphomas. The Guyton 2015 paper is only a summary of a longer paper that is in-press at this time.

In 1991, US EPA concluded that glyphosate should be classified as a Group E (evidence of non-carcinogenicity for humans) based on a lack of convincing carcinogenicity evidence and considering the criteria in EPA Guidelines for classifying a carcinogen. In a few months, US EPA will be releasing for public comment their preliminary human health risk assessment for glyphosate as part of their program to reevaluate all pesticides periodically (link to US EPA's glyphosate reevaluation docket - http://www.regulations.gov/#!docketDetail;D=EPA-HQ-OPP-2009-0361).

The USFS human health and ecological risk assessment for glyphosate (USFS 2011), includes a lengthy discussion of the mutagenic and carcinogenic potential of glyphosate including non-Hodgkin's lymphoma (Section 3.1.10). Many of the key references used in Guyton (2015) and another recent, but more in-depth review (Schinasi and Leon, 2014) are discussed in the glyphosate risk assessment. The USFS risk assessment concludes (page 70):

"The nature of the available epidemiology data on glyphosate is addressed in the U.S. EPA/OPP (2002) assessment:

This type of epidemiologic evaluation does not establish a definitive link to cancer. Furthermore, this information has limitations because it is based solely on unverified recollection of exposure to glyphosate-based herbicides.

Based on an evaluation of the available animal studies as well as epidemiology studies, U.S. EPA/OPP (2002, p. 60943) classifies the carcinogenic potential of glyphosate as Group E, No Evidence of Carcinogenicity. Given the marginal mutagenic activity of glyphosate (Section 3.1.10.1), the failure of several chronic feeding studies to demonstrate a dose-response relationship for carcinogenicity, and the limitations in the available epidemiology studies on glyphosate, the Group E classification in U.S. EPA/OPP (1993a, 2002) appears to be reasonable."

It has been USFS practice to defer to US EPA unless there is a compelling reason to do otherwise. At this point, there is not yet a compelling reason to adopt the IARC's classification since all the technical details are not yet available from IARC and since US EPA's and our analyses would indicate a different conclusion. As stated, a new risk assessment from US EPA is expected later this year which will undoubtedly consider the IARC's classification. If the US EPA accepts the IARC recommendation, then the USFS would consider an update to the glyphosate RA and for purposes of existing NEPA documents, such a reclassification would be considered 'new information'.

Studies linking glyphosate to cancer, neurological diseases, and birth defects generally are for rates, formulations, or uses that are dissimilar to this project. Some of the websites refer to cellular level studies that are not applicable to real world exposure risks. Research conducted on whole organisms (e.g. rats, quail, etc.) using plausible exposure routes (e.g. dietary, direct spray) with glyphosate provide the best available science regarding risk from Forest Service applications. Whole organism studies have been conducted, have been reviewed by EPA, are included in FS risk assessments, and form the basis of our conclusions. The risk assessments and other information in this EIS constitute best available science.

Guyton, Kathryn Z., et al. 2015. Carcinogenicity of tetrachlorvinphos, parathion, malathion, diazinon, and glyphosate. Lancet Oncology. Published online March 20, 2015. http://www.thelancet.com/pdfs/journals/lanonc/PIIS1470-2045%2815%2970134-8.pdf. Accessed online on 4/15/15.

NEPA and NFMA

262. Comment (Commenter 1): Issue #6 ----- The DEIS fails to describe the effects to recreation and scenery in Chapter 3.Without exception, EAs and EISs for timber sales written on other national forests contain effects write-ups in Chapter 3 addressing how or whether the timber sale will affect recreation and scenery. In spite of the fact this timber sale "could" or "may" affect recreation and scenery the predicted effects are not disclosed.

Request for changes to be made to the final NEPA document: Include discussions, information and data in Chapter 3 showing the effects to recreation and scenery that will result from logging, road construction and burning that will occur as part of this project. If you feel recreation and scenery will not be affected, please describe why.

Response: Direction for analysis of project effects for is that: "Agencies shall reduce excessive paperwork by: … Discussing only briefly issues other than significant ones (40 CFR 1500.4(c))". This is done by: "Using the scoping process not only to identify significant environmental issues deserving of study, but also to de-emphasize insignificant issues, narrowing the scope of the environmental impact statement process accordingly (40 CFR 1500.4(g)).

As part of the scoping process the lead agency shall: Determine the scope … and the significant issues to be analyzed in depth in the environmental impact statement. … (40 CFR 1501.7(a)(2))

Identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (1506.3), narrowing the discussion of these issues in the

statement to a brief presentation of why they will not have a significant effect on the human environment or providing a reference to their coverage elsewhere (40 CFR 1501.7(a)(3))".

Potential impacts to recreation and scenic resources in the area were not identified as an issue during project development or public scoping. Recreation specialists were consulted during initial project planning and no concerns or issues were raised based on potential impacts to recreation other than ensuring trails were not damaged during activities. Design criteria to protect recreation trails are part of the project proposal.

263. Comment (Commenter 1): Issue #12 -----Please post your responses to public comments on this DEIS online as well as maintaining a hardcopy in the Project File. Comment: Members of the public who submit comments on a draft NEPA document make the effort to read the NEPA document closely and take the time to compose comments that reflect their issues. Unless you respond to these comments and allow the public to read your responses they don't know if their comments were read and "considered."

Request for changes to be made to the final NEPA document: Post your responses to ALL public comments on the King Fire timber sale DEIS online so all 322 million Americans might read them if they choose. Hiding your responses to comments in the Project File clearly violates United States' law.

Response: The Forest Service is subject to the Council on Environmental Quality) (CEQ public involvement requirements at 40 CFR 1501.4, 1501.7, 1503.1, and 1506.6, which include informing ''persons and agencies who may be interested or affected'' by agency proposals. The CEQ regulation at 40 CFR 1506.6 further requires agencies to ''make diligent efforts to involve the public in preparing and implementing their NEPA procedures,'' 36 CFR Part 220. For each Forest Service proposal (§ 220.4(a)), the responsible official shall coordinate and integrate NEPA review and relevant environmental documents with agency decision making by:

(1) Completing the environmental document review before making a decision on the proposal;

(2) Considering environmental documents, public and agency comments (if any) on those documents, and agency responses to those comments;

(3) Including environmental documents, comments, and responses in the administrative record;

(4) Considering the alternatives analyzed in environmental document(s) before rendering a decision on the proposal; and

(5) Making a decision encompassed within the range of alternatives analyzed in the environmental documents.

Alternatives

264. Comment (Commenter 1): Request for changes to be made to the final NEPA document: Analyze a no road construction (including temp roads) alternative in detail and display the results in the final EA.

Logging Road Construction causes Significant Ecological Harm. Please Analyze an Alternative in Detail that does not Construct any New Roads (temporary or system). Such an alternative is not Unreasonable. Sadly, a connected action to the timber harvest in the Proposed Action is to construct an undisclosed number of miles of temporary road.

A no road construction and reconstruction alternative will likely reduce the sale volume slightly. However, it stands out among the possible action alternatives that could be analyzed in detail because it reduces the adverse environmental effects of logging while still meeting the purpose and need for the project.

Comment: Please don't tell me you will not analyze a "no new road" alternative in detail because the P&N will not be met. The P&N does not specify a certain number of treatment acres. The

"no new roads" alternative will reduce the acres logged, but will still meet the P&N. You know this. Comment: Without exception, road construction and reconstruction is an activity that causes damage to some important natural resources in the forest. New road construction is particularly detrimental to aquatic and wildlife resources. Chief Dombeck's statement below supports this fact. *"Roads often cause serious ecological impacts. There are few more irreparable marks we can leave on the land than to build a road."* Dr. Mike Dombeck, Chief, US Forest Service.

Remarks to Forest Service employees and retirees at the University of Montana February 1998.Link to statement:

https://www.uwsp.edu/cnr/gem/Dombeck/MDSpeeches/CD%20COPY/Chief%20Mike%20Dombeck%27s%20Remarks%20to%20Forest%20Service%20Employees%20and%20.htm

Opposing Views Attachment #4 contains statements by hundreds of Ph.D. scientists describing Chief Dombeck's observations in greater detail.

Comment: Since best science and Chief Dombeck agree that there are few more irreparable marks we can leave on the land than to build and reconstruct road, this is a valid reason to analyze this alternative in detail.

Request for changes to be made to the final NEPA document: Analyze a no road construction (including temp roads) alternative in detail and display the results in the final EA.

Response: Forest Service policy is that for each alternative considered in detail, analyze and document the environmental effects, including the effectiveness of the mitigation measures that would result from implementing each alternative, including the no-action alternative (FSH 1909.15). Citations in the attachments were reviewed and analyzed based on comments provided.

The minor road reconstruction proposed as part of this project would include application of site-specific standards and guidelines for resource protection as described in the Eldorado National Forest Land and Resource Management Plan (LRMP) and Best Management Practices (BMPs) 12.2 Road Building, 12.5 Vegetation Management and 12.7 Watershed Management. Forest Service BMPs currently incorporated into road maintenance activities on the Eldorado National Forest include:

- Road surfacing (road rocking, chip sealing, etc..) is oftentimes included in reconstruction activities to not only provide better traffic usage; but also to prevent and control erosion from the road surface
- Road drainage controls are being incorporated into designs that are intended to:
- Reduce the erosive flows in ditches by providing frequent cross-drains to relieve ditch flows;
- Avoid water movement down the road by dispersing the drainage quickly by crowning or outsloping the road surface;
- Disperse drainage water (that often carries sediment) onto stable forested slopes before ditches discharge into waterways;
- Ensure new and existing stream crossings safely pass extreme events when constructed or reconstructed (i.e. 100-year flood event).

Designers and planners develop road networks that avoid highly erosive or unstable slopes utilizing the land systems inventory, and the knowledge and experience of hydrologists, soil scientists, and geotechnical engineers. Road treatments include the elimination of ruts, repair of

ditches, repair or installation of dips and waterbars, and the replacement of non-functional or undersized culverts.

Direction from CEQ is to "Study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources as provided by section 102(2)(E) of the Act." (40 CFR 1501.2(c)) Reasonable alternatives to the proposed action should fulfill the purpose and need and address unresolved conflicts related to the proposed action. Be alert for alternatives suggested by participants in scoping and public involvement activities. Consider alternatives, even if outside the jurisdiction of the Agency (FSH 1909.15).

The commenter has submitted information with potentially opposing scientific views from those used to develop and analyze the project. This information is reviewed and analyzed where it is referenced. We agree that best available science should be used to design and evaluate Forest Service actions. The best available science was used to design the project activities and to evaluate the positive and negative effects of project actions on individual resources. Every action including no action has an effect on Forest resources. The purpose of the King Fire EIS is to display and document those effects to inform a decision. In addition to literature cited in the FEIS, there are references in specialist reports and documents incorporated by reference. Opposing scientific opinions have been acknowledged and evaluated where presented.

265. Comment (Commenter 1): Issue #26 -----Please respond to the opposing views contained in the Opposing Views Attachments to these comments to the comments.

Request for changes to be made to the final NEPA document: Each opposing viewpoint is different and is related to a unique subject, therefore a single response attempting to deal with all opposing views simultaneously does not respond to opposing views as required by law. Please respond to each opposing view and post the responses online for the public to see. Simply placing a hardcopy of your opposing views responses in the project file located at the district hides the information from the American public.

Response: The commenter has submitted information with potentially opposing scientific views from those used to develop and analyze the project. This information is reviewed and analyzed where it is referenced. We agree that best available science should be used to design and evaluate Forest Service actions. The best available science was used to design the project activities and to evaluate the positive and negative effects of project actions on individual resources. Every action including no action has an effect on Forest resources. The purpose of the King Fire EIS is to display and document those effects to inform a decision. In addition to literature cited in the FEIS, there are references in specialist reports and documents incorporated by reference. Opposing scientific opinions have been acknowledged and evaluated where presented.

(b) All substantive comments received on the draft statement (or summaries thereof where the response has been exceptionally voluminous), should be attached to the final statement whether or not the comment is thought to merit individual discussion by the agency in the text of the statement (40 CFR 1503.4). The response to comments is included in the EIS as an appendix.

266. Comment (Commenter 1): Issue #33 ----- Please identify the environmentally preferable alternative in the draft Record of Decision. Please make sure to identify the environmentally preferable alternative in the draft Record of Decision. Also tell the public why the chosen environmentally preferable alternative is environmentally preferable to the other alternatives. Request for changes to be made to the final NEPA document: Reissue the final EIS and modified draft ROD that includes the environmentally preferable alternative with discussions

divulging why of all the alternatives analyzed in detail you chose the environmentally preferable alternative.

Response: In the Decision Document for this project, the Responsible Official will document how the best available scientific information was used to inform the assessments and decisions made for this project. The Forest Service has reviewed and considered the opposing science viewpoints provided through the public involvement on this project. All documents referenced in this attachment, unless otherwise noted, are contained in the Project File.

267. Comment (Commenter 1): "Summarize, as relevant, information from scoping (Step 4 above). In this summary, highlight decisions your team made regarding possible alternatives and potential mitigations that link to different alternatives. This information should further prove that your team was open to different alternatives, especially any that the public suggested."

"Remember not to be silent about the reasons for considering some alternatives and ignoring others. Silence is a gift to a possible plaintiff. So plan for and provide even a brief rationale about your range of alternatives. Such a discussion is especially important if your EA or EIS includes only a single action alternative. A single action alternative is a risky agency choice, especially if you determine that your EA or EIS is likely to be a high-risk and controversial document."

Range of Reasonable Alternatives

Feature Article, November 2009

by Larry Freeman, PhD

The Shipley Group, *Senior Consultant*

Link: http://www.shipleygroup.com/news/articles/0911.pdf

Comment: You ignore Shipley Group NEPA recommendations. Doesn't the USFS spend millions of dollars to hire this company to teach agency employees how apply the NEPA process? Are your qualifications comparable to Dr. Freeman who works for the Shipley Group?

Comment: The Administrative Procedures Act directs judges to set aside an agency action if the court determines that the action is "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. § 706(2)(A). An agency that ignores the preponderance of available information and instead makes a Decision on insubstantial, weak, meager evidence provided by people with financial interest in a Decision being decided one way and literature authored by biased, agency employees who know they must never discuss timber sales in a negative way is guilty of violating the APA.

Response: Response to comment documents for the scoping period and this Legal Notice and comment period will be posted online as the commenter has requested. All documents found in the project record are available by request, and can be sent electronically.

Sixty-six scoping comments were received for the King Fire Restoration Project, many of which were supporting the project, some were against, and some requested modifications. A majority of the respondents are residents of El Dorado County and were affected by the King Fire. Several studies have found a high level of public support for salvage logging in communities that have experienced a nearby wildfire, or are located in an area where the risk of wildfire is high (Long et al, 2014).

As discussed on page 6 of the FEIS, extensive public involvement and public outreach occurred throughout the development of the alternatives for this project. The feedback and input from interested parties and participants was integral in the development of the action alternatives. The project file contains records of meetings, field trips, and public notices listed below.

- On November 12, 2014, a field trip took place to the fire area with stakeholders and interested parties to begin discussing post-fire recovery projects and solicit ideas to help develop the proposed action. Stakeholders included State, Federal, and local elected officials and staff, community liaison partners, utility company and water agency representatives, and representatives from industry and environmental groups.
- A Sierra Nevada Conservancy sponsored field trip took place on November 19, 2014, with Forest Service staff, State legislative members and staff, utility company and water agency representations, local elected officials, and other interested stakeholders.
- A meeting was held December 4, 2014, between the interdisciplinary team and interested and affected stakeholders to further discuss elements of the King Fire Restoration Project proposed action.
- The Notice of Intent (NOI) was published December 24, 2014, beginning the formal scoping period.
- Letters were sent to all interested parties with information on the proposed action and scoping period.
- The Forest developed multiple types of media and internet venues for the public to stay informed with the project and offer opportunities to comment, including the King Fire Restoration Schedule of Proposed Actions webpage and information on the Eldorado National Forest website.
- A workshop was held January 13, 2015, to engage and inform the public and solicit scoping comments.
- A scoping meeting with White Meadows community was held on January 5, 2015.
- A meeting with elected officials was held January 13, 2015, to discuss the proposed action.
- A meeting was held January 15, 2015, with agency officials from the Central Valley Water Quality Control Board and the California Department of Fish and Wildlife.
- A presentation and discussion was held at the Amador-El Dorado Forest Forum meeting on January 21, 2015. The forum is a group of forestry professionals, loggers, and citizens interested in forest management.
- A meeting with interested citizens, a County Supervisor, Congressman McClintock's office, and the California Forestry Association was held on February 25, 2015; the topic was concern over not doing enough salvage harvesting.
- A meeting was held on March 2, 2015, between members of the IDT and the Central Valley Water Quality Control Board to discuss their scoping comments.
- Informal discussions between Forest staff and members of Sierra Forest Legacy were conducted to understand and clarify their scoping comments and develop Alternative 3 to address their issues and proposals.
- A public meeting was held March 25, 2015, to preview the alternatives developed in response to scoping. This meeting was covered by both television and print media.

References

268. Comment (Commenter 1): Issue #34 ----- You have consciously selected literature for the References section that excludes science describing how logging will adversely affect non-timber natural resources in the sale area. Professionals do not selectively choose literature citations that will support their case and systematically exclude those that don't. The majority of your references are biased, since they were authored by forest service employees. Even random

selection of science literature related to logging would have included several of the hundreds of science documents contained in the Opposing Views Attachments. None of this literature is listed in the References.

The quotes by hundreds of Ph.D. scientists in the Opposing Views Attachments describe the resource damage that logging at any location is at odds with the IDT claims the sale will benefit and restore the natural resources in the area. Anyone (including a judge) would agree that the research conclusions of hundreds of well-respected scientists (many college professors) represents best science. Your proposal to offer the King Fire timber sale in spite of the scientist's conclusion ignores best science, therefore you 1) violate the law, and 2) reject your responsibility to serve the recreating public. See below.

"This uncertainty has affected the ability of the Forest Service to utilize fully the provisions of § 219.35 paragraph (a) to consider the best science available in plan amendments and project decision making. For example, while population data have been held to be required for management indicator species under the 1982 rules, other tools often can be useful and more appropriate in predicting the effects of projects that implement a land management plan, such as examining the effect of proposed activities on the habitat of specific species; using information identified, obtained, or developed through a variety of methods, such as assessments, analysis, and monitoring results; or using information obtained from other sources such as State fish and wildlife agencies and organizations such as The Nature Conservancy. The purpose of this interpretative rule is to clarify that, both for projects implementing plans and plan amendments, paragraph (a)'s mandate to use the best available science applies."

"The transition provisions as originally enacted, and now twice amended, explicitly refer to the 1982 planning rule as the rule ''in effect prior to November 9, 2000.'' At the same time, given the extension of the effective date of paragraph (d), within which site specific decisions must comply with the 2000 planning rule (68 FR 53294), it is clear that site-specific decisions entered into during the transition period are not to comply with the substantive provisions of the 2000 planning rule. This interpretative rule clarifies that until a new final rule is promulgated, the transition provisions of the 2000 planning rule, as amended by the May 2002 interim final rule remain in effect, including the requirement of § 219.35 paragraph (a) of the transition provisions that responsible officials consider the best available science in implementing national forest land management plans and, as appropriate, plan amendments. Pursuant to paragraph (b), the provisions of the 1982 planning rule may continue to be used only for plan amendments and revisions upon election of the responsible official. Appropriate plan amendments and projects proposed during the transition period should be developed considering the best available science in accordance with § 219.35 paragraph (a)."

Federal Register / Vol. 69, No. 188, page 58056

Wednesday, September 29, 2004

Rules and Regulations

http://www.fs.fed.us/r1//projects/plan_rule/intrpretative-rule.pdf

Request for changes to be made to the final NEPA document: Include some source documents from the Opposing Views Attachments in the References section of the final EIS. Also, cite the specific quotes presented for the source literature chosen by this member of the public in the text of the EIS. Not doing so and searching the source literature for benign statements to cite will continue your selective use of information that only provides information that supports your timber sale. Don't try to trick the public into supporting the sale by hiding important information. Finally, include clickable links to each Opposing Views Attachments you choose to include in your reference section and explain why this is best science and trumps the information presented in the EIS.

The public deserves to be informed of this information so they can make an informed decision to support or oppose the timber sale based on complete data.

Response: The comments do not include a specific point of dispute or debate with the proposed activities as described in the EIS. The commenter has submitted information with potentially opposing scientific views from those used to develop and analyze the project. This information is reviewed and analyzed where it is referenced. We agree that best available science should be used to design and evaluate Forest Service actions. The best available science was used to design the project activities and to evaluate the positive and negative effects of project actions on individual resources. Every action including no action has an effect on Forest resources. The purpose of the King Fire EIS is to display and document those effects to inform a decision. In addition to literature cited in the FEIS, there are references in specialist reports and documents incorporated by reference. Opposing scientific opinions have been acknowledged and evaluated where presented.

Ethical conduct of employees regarding personal financial interests are regulated through: gifts from outside sources (subpart b - 5 CFR 2635.201-205), conflicting financial interests (subpart d - 5 CFR 2635.401-403), and impartiality in performing official duties (subpart e - 5 CFR 2635.501-503. The purpose and need for the project is described in the EIS for the project. Employees financially benefiting from the sale of Forest Service products would be a violation of ethics codes and regulations that would subject employees suspect of such activities to have their employment terminated and be prosecuted to the full extent of the law.

Recreation and Visual Resources

269. Comment (Commenter 1): Issue #5 ----- The Interdisciplinary Team listed in the DEIS is inadequate to assess and divulge the environmental effects of sale implementation in Chapter 3 on the natural resources that are likely to be affected by the King Fire timber sale. The public expects (and the law requires) ALL USFS line-officers acting in a Responsible Official capacity to staff their IDTs with professionals who specialize in the resources they represent. There is no fisheries biologist, recreation specialist and landscape architect listed as IDT members.

Request for changes to be made to the final NEPA document: Add a fisheries biologist, recreation specialist and landscape architect to the IDT and have them re-write and modify the analysis of aquatic wildlife effects and write the effects analysis to scenery and recreation.

Response: Comment noted. The hiring agency determines whether a job seeker meets the qualifications. Direction for analysis of project effects for is that: "Agencies shall reduce excessive paperwork by: … Discussing only briefly issues other than significant ones …(40 CFR 1500.4(c))" This is done by:

"Using the scoping process not only to identify significant environmental issues deserving of study, but also to deemphasize insignificant issues, narrowing the scope of the environmental impact statement process accordingly …(40 CFR 1500.4(g)) As part of the scoping process the lead agency shall: …Determine the scope … and the significant issues to be analyzed in depth in the environmental impact statement. … (40 CFR 1501.7(a)(2)) Identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (1506.3), narrowing the discussion of these issues in the statement to a brief presentation of why they will not have a significant effect on the human environment or providing a reference to their coverage elsewhere. (40 CFR 1501.7(a)(3))"

Potential impacts to recreation and visual resources in the area were not identified as a significant environmental issue during project development or public scoping. Recreation and visual resource specialists were represented on ID team during initial project planning and no concerns or issues were raised based on potential impacts to recreation other than ensuring trails were not damaged during activities. Design criteria to protect recreation trails are part of the project proposal.

Fisheries resources are addressed as part of the Aquatic Resources analysis in Chapter 3. An Aquatic Biologist was included on the ID Team.

Salvage

270. Comment (Commenter 1): Request for changes to be made to the final NEPA document: The USFS tells the public their projects are based on "best science." Opposing Views Attachments #2, #8, #5, #14 and #15 contains quotes by 512 Ph.D. scientists not associated with the USFS who recommend that post-fire landscapes must never be logged for any reason. Please either select the No Action alternative, or include science in the final EIS that recommends and justifies post-fire logging that is at least as convincing as 512 Ph.D. scientists.

Issue #40--- Best science clearly indicates that post-fire logging causes significant, long-term, irreversible harm to the natural resources in the burned landscape. These burned areas are so fragile and ecologically important they should never be subject to heavy equipment use to remove the dead and dying trees to provide short-term profit for the corporation that logs the area. These dead and dying trees are orders of magnitude more important to the proper functioning of the resources in a post-fire landscape than money.

No human development action in the forest inflicts more long-term ecosystem damage than a post-fire timber sale. Anyone (including the USFS Responsible Official and IDT members) who spends the American tax dollar planning and preparing a post-fire timber sale contributes to the corporate domination and rule of America.

The USFS's cozy relationship with timber corporations is now big news. The article at the link below explaining the Stanislaus National Forest's plans to clearcut 72 square miles of forest burned by the Rim fire in adjacent to Yosemite National Park was published by *National Geographic* in July of 2014. The Stanislaus National Forest was aware of the post-fire logging related court losses and bad press. How did they respond? They illegally shortened the comment period on the EIS from 45-days to 30-days to reduce the number of critical comments they would receive and have to respond to. Numerous lawsuits have been filed.

http://news.nationalgeographic.com/news/2014/07/140714-rim-fire-salvage-logging-forest-ecology-wildfire-restoration/ A post-fire timber sale takes from the land and gives nothing back. A fire is Natures way of restoring forests. Please have the courage to read independent science authored by a scientist with no reason to promote logging. Here's an excerpt from the document:

"A new publication titled Post Fire logging reduces surface woody fuels up to four decades following wildfire was published in Forest Ecology and Management this week. You can find the article here:

http://www.sciencedirect.com/science/article/pii/S0378112714006823

The research will undoubtedly be used by pro logging advocates to justify more post fire logging under the guise that it will prevent or reduce future severe fires–which is the conclusion of the study for a specific short period of perhaps 10-20 years."

"The study of course is only about fuels. But fuels are not the only thing to consider. We know the second highest biodiversity is found in severe wildfires. Eliminating or reducing the opportunities for future fires is not good for the forest ecosystem. There are many species that live in fear of green forests. They are recovering from forest fire protection and green forests. They need the post fire environment."

> "In short be prepared to hear logging advocates suggest that post fire logging will benefit the forest ecosystem. In reality logging degrades forests. Unfortunately this paper may provide support for the continued impoverishment of our forested ecosystems."
>
> Source: "Post Fire Logging–a bad deal for forest ecosystems"

published in the *Wildlife News*, March 19, 2015

http://www.thewildlifenews.com/2015/03/19/post-fire-logging-a-bad-deal-for-forest-ecosystems/

Most line-officers who propose post-fire timber sales claim the need to "capture the volume before it deteriorates" or "recover the economic value of burned timber before the commercial value of the wood is lost to deterioration." The wording for the witless justification for the King Fire sale is a little different:

"Expeditiously recover timber killed by the fire commensurate with available markets for the purpose of generating funds to offset the cost of restoration activities and contribute to societal needs for wood products" (page 1-5)

There is no shortage of softwood in America. Indeed, it's currently being exported by companies that own private industrial tree farms. A competent, caring USFS Ranger wouldn't think of stopping the natural restoration process for corporate profit.

Dead and dying trees in the wake of a fire are supposed to deteriorate and rot (emphasis added)! That's what creates the unique post-fire wildlife habitat. Any human manipulation of this landscape minimizes and sometimes destroys the ecological benefits that Nature provides with a fire.

Comment: There are no ecological benefits from removing dead and dying trees from a post-fire landscape … only ecological destruction.

Comment: Opposing Views Attachment #2 contains quoted statements of more than 400 Ph.D. scientists who are experts in their fields. Their statements describe how scores of natural resources in the post-fire landscape that are damaged and/or destroyed by logging. As the scientists point out, some of this damage is long-term and so severe the resources will cease to function properly and the landscape will only restore itself after many decades if humans leave it alone. These independent scientists not connected with the USFS all conclude human actions following any post-fire timber sale will only slow down (and sometimes eliminate) the natural restoration process. Allowing the advice of several of your timber employees financially motivated to sell this sale to trump over 400 Ph.D. scientists is not something a normal person would do.

Please honestly examine the tradeoffs between providing opportunities for resource extraction corporations to profit financially vs. the long-term ecological damage that post-fire logging will inflict. Spending your yearly timber funding and pleasing your supervisor by meeting their volume expectations must never justify post-fire logging.

Indeed, the Federal Courts agree that the Responsible Official must disclose and consider "adverse impacts" when making the final decision that the IDT has failed to do here.

Earth Island Institute and Center for Biological Diversity v. Dale Bosworth Chief of the US Forest Service and John Berry Supervisor of the Eldorado National Forest, Ninth Circuit Court of Appeals, Filed March 24, 2006

http://ftp.resource.org/courts.gov/c/F3/442/442.F3d.1147.05-16776.html

"Conclusion: We have noticed a disturbing trend in the USFS's recent timber-harvesting and timber-sale activities. *See, e.g.*, *Ecology Ctr., Inc. v. Austin*, 430 F.3d 1057 (9th Cir. 2005) (holding that the USFS's post-fire treatment of old-growth forest stands in the Lolo National Forest violated both the NFMA and NEPA, and that the EIS failed to explain adequately the adverse impacts of the proposed plan on the black-backed woodpecker); *Lands Council v. Powell*, 395 F.3d 1019 (9th Cir. 2005) (reversing the district court's grant of summary judgment to the USFS because its EIS did not take a "hard look" at past timber harvests or current trout habitat conditions); *Idaho Sporting Cong. v. Rittenhouse*, 305 F.3d 957 (9th Cir. 2002) (remanding to the district court to enjoin two timber sales approved in

violation of the NFMA and NEPA). *See also Utah Envtl. Cong. v. Bosworth*, 421 F.3d 1105 (10th Cir. 2005) (holding that the USFS did not properly monitor MIS species and did not consider a reasonable range of alternatives in a proposed timber-harvesting project); *Sierra Club v. Eubanks*, 335 F. Supp. 2d 1070 (E.D. Cal. 2004) (granting a preliminary injunction against salvage logging provided for in the USFS's post-fire Red Star Restoration Project); *Sierra Club v. Bosworth*, 199 F. Supp. 2d 971 (N.D. Cal. 2002) (rejecting the USFS's argument that post-fire salvage burning was needed to prevent a future fire and enjoining implementation of post-fire salvage logging); *Colo. Wild v. U.S. Forest Serv.*, 299 F.Supp.2d 1184 (D. Colo. 2004) (granting a preliminary injunction of a timber salvage project because the USFS failed to gather population data for MIS species); *Forest Guardians v. U.S. Forest Serv.*, 180 F. Supp. 2d 1273 (D. N.M. 2001) (reversing authorization of a timber sale in the Cibola National Forest because of the USFS's failure to collect adequate MIS population data)."

Please protect and preserve my national forest land by seeking your volume elsewhere.

Please see Attachments #8, #5, #14 and #15. Dead and dying trees have more value if left in the forest to function as Nature intended than removing them to provide corporate profit.

Response: The comments do not include a specific point of dispute or debate with the proposed activities as described in the EIS. The commenter has submitted information with potentially opposing scientific views from those used to develop and analyze the project. This information is reviewed and analyzed where it is referenced. We agree that best available science should be used to design and evaluate Forest Service actions. The best available science was used to design the project activities and to evaluate the positive and negative effects of project actions on individual resources. Every action including no action has an effect on Forest resources. The purpose of the King Fire EIS is to display and document those effects to inform a decision. In addition to literature cited in the FEIS, there are references in specialist reports and documents incorporated by reference. Opposing scientific opinions have been acknowledged and evaluated where presented.

271. Comment (Commenter 1): Issue #36 ----- Logging does not Restore the Forest

Definitions of "restoration": Oxford Dictionary -- Bring back (a previous right, practice, custom, or situation); reinstate: Webster -- to return (something) to an earlier or original condition by repairing it, cleaning it, etc. Cambridge Dictionary -- to return something or someone to an earlier condition or position , or to bring something back into existence: Collins Dictionary -- to return (something, esp a work of art or building) to an original or former condition

Comment: Anyone with basic knowledge of forest ecology knows that all forests pass through many, many different states until they return to the original. Each state is biodiverse … if humans keep away. There is no ecological reason to return to any specific forest state that existed in the past. None are ecologically any better than any other. It's sad that humans hopelessly overcome by greed and the need for money tell the public a forest state with large trees with high lumber value is needed and tell them its needed to enhance the forested ecosystem. The only thing this enhances is the purchaser's profits the next time it's logged.

The USFS has been aware that most American citizens do not want their national forests logged. I remember when the USFS used the terms logging and timber sales. In 2008 Chief Kimbell directed all USFS line-officers to instead use the term "restoration project" as you have done here. She thought that using a euphemism for logging would cause the

public to believe logging is a good thing that should occur.

You know the only thing logging and road construction activities in the forest restore is the purchaser's financial bottom line. Does it make you proud to use the public's tax dollars to deceive and trick them? Are you proud?

Katz (1991) critiques the USFS claim that a commercial timber sale restores the ecosystem and creates a healthier forest:

"A 'restored' nature is an artifact created to meet human satisfactions and interests…it is an unrecognized manifestation of the insidious dream of human domination over nature. Once and for all, humanity will demonstrate its mastery of nature by "restoring" and repairing the degraded ecosystems of the biosphere."

Comment: On November 6, 2001 USDA Assistant Inspector General for Audit Richard D. Long mailed the "Western Region Audit Report: Forest Service National Fire Plan Implementation" to Chief Bosworth. The report stated: "We concluded that commercial timber sales do not meet the criteria for forest restoration." (Pg. 11)

Link to Report No. 08601-26-SF: http://www.usda.gov/oig/webdocs/08601-26-SF.pdf

Do you routinely ignore the USDA Inspector General's office?

Comment: You can cite any definition of restoration conjured up by the USFS you want to counter my argument that the reason you claim this is a "restoration" sale is to trick the public. When the judge compares this with the clear language of the "Western Region Audit Report" who will he/she believe?

Comment: If you still believe logging restores, improves and creates a healthier forested ecosystem, please see Opposing Views Attachment #21. You can be sure your agency takes extraordinary measures to assure these science papers authored by Dr. Platt, Dr. Thomas, Dr. Veblen, Dr. Ingalsbee, Dr. Peters, Dr. Roberson, Dr. Power, and Dr. Partridge are never read by USFS employees. Do you believe these 8 well-respected scientists are radical environmentalists? Why then do you reject their research conclusions?

Request for changes to be made to the final NEPA document: Give the public the whole story. In order to provide meaningful, well informed comments the public must be exposed to the pros and cons of logging. It's unprofessional to withhold this important information written by experts that criticize projects such as yours. Please include and cite the quotes in the 8 papers referenced above the References section of the final EA.

Response: The comments do not include a specific point of dispute or debate with the proposed activities as described in the EIS. The King Fire Restoration Project is designed using multiple activities to move the project landscape from the current condition to a more resilient and sustainable condition. Sale of forest products (commercial timber) using stewardship authorities to fund other proposed activities is one of the tools proposed to achieve project goals and objectives in the project area; however delivery of forest products it is not the purpose of this project.

CEQ regulations direct the Forest Service to "(b) Provide public notice of NEPA-related hearings, public meetings, and the availability of environmental documents so as to inform those persons and agencies who may be interested or affected (1) In all cases the agency shall mail notice to those who have requested it on an individual action (d) Solicit appropriate information from the public. (40 CFR 1506.6)" Scoping was conducted in accordance with CEQ regulations and comments were reviewed according to FSH 1909.15 to identify issues, identify non-issues and to develop alternatives.

Society, Culture and Economy

272. Comment (Commenter 1): Issue #19 ----- The DEIS contains no economic analysis to determine if the USFS will spend more money planning, preparing and administering the sale than they receive from the timber purchaser who buys the sale.

Comment: The DEIS at page 2-33 states: *"An economic analysis of this alternative was also done to determine whether sufficient funds would be generated to offset fuel treatment costs."* This is the only reference to an economic analyses in the DEIS. Had an economic analysis been done, the results (costs and revenues) would have been displayed. Do you really expect the public to take your word? The USFS must complete an economic analysis for all proposed projects using tax dollars to show the public if they are receiving an adequate return on their dollar. The public wants to know if this timber sale is a below-cost sale. The following national website discusses this situation. "taxpayers are essentially asked to pay several times to subsidize the degradation of our natural resources; initially to create the damage by logging, then to mitigate those damages, and last, to repair the damages from logging."

From: *Taxpayer Losses from Logging Our National Forests*, 2005
Link: http://www.johnmuirproject.org/pdf/JMP-NFTaxLoss.pdf

Request for changes to be made to the final NEPA document: Include a complete economic analysis. The public has the right to know how their tax dollars are being used. The USFS has the responsibility to show them. This should include projected revenues and agency costs associated with the timber sale (including overhead and travel costs). Costs associated with sale administration throughout the life of the sale should be included.

An economic analysis of a proposed USFS timber sale showing the public whether the sale is below cost is not the same as an analysis to determine the profitability to the purchaser. Leave the profit analysis to the purchaser. That's their job.

Response: Page 121 to 176 of the FEIS includes a detailed and complete economic analysis including projected revenues and costs for alternatives 2 through 5 (see table 3E.2).

Transportation System

273. Comment (Commenter 1): Issue #25 ----- If you were really concerned about aquatic species' health you would indicate in the final EA that all newly constructed temporary roads will be obliterated after use and apply the obliteration method that returns the ground to the natural angle of repose and eliminates the running surface. Not doing so clearly indicates you have no intent of using the road temporarily.

Comment: Roads that will be used again in the future must be constructed to system road standards with surfacing and a ditch to reduce sediment generation. If the final EA does not clearly indicate that your proposed temporary roads will be obliterated such that a running surface no longer exists it will show you plan to allow these temporary roads to pump sediment for decades until the so-called temporary road is used again for the next timber sale. Please become familiar with the Clean Water Act.

The DEIS indicates a secret number of miles of temporary roads will be constructed as part this timber sale. At page 2-8 you say:

"Construct no new system roads. Temporary roads may be constructed to access landings. Following use, any cut or fill slopes will be reshaped into surrounding slope and temporary roads will be scarified, drained, and blocked to vehicular traffic."

Comment: You indicate temporary roads following use will have the cut or fill slopes will be reshaped into surrounding slope and temporary roads will be scarified, drained, and blocked to vehicular traffic scarified, drained, and blocked to vehicular traffic after use. Are you serious? If you reshape the cut or fill slopes into the surrounding slope there will be no running surface scarified and drained. Why block a road to vehicular traffic if thyere is no place to drive?

Comment: Since temporary roads are outsloped with no ditch, sediment that is generated during precipitation events, finds its way to streams and harms the aquatic resources for decades after initial construction … unless the road is obliterated. No other post-use treatment method (including your crazy proposal) is as effective at eliminating damage to aquatic resources and subsurface water flow as obliteration. You know this. The reason you aren't obliterating the temp roads is because you plan to use them again when the area is logged next time. Indeed, the USFS does not construct temporary roads.

Links to science showing complete obliteration is more effective at reducing long-term sediment generation than any other closure methods are included below:

"Obliteration

Obliteration can be the most effective treatment for both aquatic and terrestrial species. In full obliteration, culverts are removed, road surfaces are ripped and slopes are recontoured (see below for explanations of these treatments). In simple decommissioning, sites (such as stream crossings) are treated, but the segments (such as the roadbed between two stream crossings, or between water bars) are left intact. In obliteration, all sites and segments are treated. Subsurface water flow is no longer interrupted, allowing water to flow normally throughout the system and therefore aiding with vegetative recovery and reconnecting fragmented habitat. Recovering the original topsoil may also aid in revegetative success and limit the spread of non-native species on the site. Road obliteration, therefore, addresses both the aquatic/hydrologic and terrestrial problems caused by roads."

From "AN EXPLANATION AND ASSESSMENT OF ROAD REMOVAL IN VARIED HABITATS"

By Bethanie Walder and Scott Bagley

Published by the Wildlands Center for Preventing Roads, Missoula, MT

Link: http://ntl.bts.gov/DOCS/ICOWET_III/icowet3paper.pdf

"Unless a road is fully obliterated, it is bound to continue receiving human use and fail to fully revegetate."

"These facts and common sense show clearly that a road will not cease functioning as a road or trail until it is fully obliterated to the point where travel off of the former roadbed is easier than travel on it. As the following discussion on the benefits of road obliteration will show, simply gating a road or taking it off of the inventory does not make the impacts or the road go away."

From: "Road Obliteration: Benefits to the Watershed and Its Inhabitants"

A Swan View Coalition publication by Keith Hammer, 1994

Link: http://www.swanview.org/home/articles/reports-documents/road_obliteration_benefits_to_the_watershed_and_its_inhabitants/56

"We also believe that roads which cannot be properly maintained should be considered for closure or decommissioning, with natural landscapes and drainages restored (i.e., culverts removed). Road density in the Whitetail-Pipestone area is very high and reduction in road density is needed to protect resources. We believe road networks should be limited to those that are

necessary for access and management, and which can be adequately maintained within agency budgets and capabilities. Roads that impact water quality, fisheries and/or sensitive and listed wildlife species should be prioritized for closure and/or decommissioning to maximize ecological benefits. We also recommend road obliteration or full road recontour as a preferred method of road closure, since it is often difficult to effectively restrict motorized access and protect public lands with simple gated road closures."

From: a November 5, 2008, letter to Bruce Ramsey, Forest Supervisor, Beaverhead-Deerlodge National Forest written by John F. Wardell, Director, EPA Montana Office.

Link:
http://yosemite.epa.gov/oeca/webeis.nsf/(PDFView)/20080402/$file/20080402.PDF?OpenElement

"Obliteration and road removal have a different goal than restricting motorized access. The objective is to discourage and prevent all activities on the road, including foot travel, terminate further erosion to prevent mass failures, and reestablish the natural landscape. Road obliteration and related restoration work are steps in environmental healing and initiating positive trending in natural processes (USDA 1996)."

Source: http://www.wildlandscpr.org/files/FieldGuideRdClosures.pdf

To reduce confusion, here are definitions of road obliteration:

"obliteration - to completely remove the road feature from the landscape. This is accomplished by full recontouring. See full recontouring."

"full recontouring - the treatment of a road that completely eliminates (obliterates) the road from the landscape. Full recontouring is accomplished by recovering all available fill and burying the cutbank until the surrounding terrain is fully matched. This type of treatment is also referred to as road removal or road obliteration. See obliteration."

Source: http://www.parks.ca.gov/pages/23071/files/fullroadrecontourbmp5_03.pdf

Here's what the EPA recommends:

"Road closure and obliteration is one of the most important methods used to improve and protect watersheds within the National Forests of the Pacific Northwest. These are generally compacted, have little sideslope, and usually have grades less than 15%. Road obliteration is the process of removing and treating roads, resulting in partial to complete recontouring of the site to match the surrounding natural terrain.

The main objectives of forest road obliteration are to restore hillslope hydrology, decrease surface erosion and the risk of mass wasting, and promote the re-establishment of native vegetation." (page 2)

Source: http://www.epa.gov/wastes/conserve/tools/greenscapes/pubs/compost-uw.pdf

Here are links to other sources clearly showing the superiority of road obliteration:

http://www.swanview.org/home/articles/reports-documents/road_obliteration_benefits_to_the_watershed_and_its_inhabitants/56

http://www.parks.ca.gov/pages/939/files/Full%20Road%20Recontour.pdf

After the temp roads are obliterated or decommissioned they must be monitored over time to assure they are not generating sediment. This DEIS contains no such monitoring plan.

The forest service discusses the need to monitor road decommissioning methods:

"Several national forests have developed road decommissioning monitoring plans. This report builds on their hard work and careful thought to creating a successful monitoring plan. Instead of advocating one method or process for each monitoring project and budget, this document enables selection of the monitoring technique(s) for each situation. Monitoring forms and protocols are attached that can help a district or forest interdisciplinary team design a road decommissioning monitoring program for their area."

From : "Road Decommisioning" by Carolyn Napper, USFS Soils Scientist

A USDA Forest Service Technology and Development paper

Link to paper: http://www.fs.fed.us/t-d/programs/im/road_decomission/road_decommissioning.shtml

Comment: Obviously, you ignore agency policy.

The DEIS contains nothing to indicate why temp road monitoring is not necessary on this project.

Please see Opposing Views Attachment #4.

Request for changes to be made to the final NEPA document: Please indicate all temporary roads will be obliterated after use and tell the public this will be done in the draft decision document, or provide scientific information authored by independent scientists in the response to comments that indicates there are other methods as effective at long term sediment elimination as obliteration.

Please define road obliteration using the statement below (or something similar) in the draft decision document to eliminate confusion:

When roads are obliterated the road is completely eliminated from the landscape. Full recontouring is accomplished by recovering all available fill and burying the cutbank until the surrounding terrain is fully matched.

Also, please assure the final NEPA document describes the road obliteration monitoring plan to assure the sediment is being reduced as expected. The resulting draft decision documents should indicate the USFS will provide funding for the monitoring and accomplish the monitoring.

Response: Forest Service policy is that for each alternative considered in detail, analyze and document the environmental effects, including the effectiveness of the mitigation measures that would result from implementing each alternative, including the no-action alternative (FSH 1909.15). Citations in the attachments were reviewed and analyzed based on comments provided.

The minor and temporary road construction proposed as part of this project would include application of site-specific standards and guidelines for resource protection as described in the Eldorado National Forest Land and Resource Management Plan (LRMP) and Best Management Practices (BMPs) 12.2 Road Building, 12.5 Vegetation Management and 12.7 Watershed Management. Forest Service BMPs currently incorporated into road construction and reconstruction activities on the Eldorado National Forest include:

- Road surfacing (road rocking, chip sealing, etc..) is oftentimes included in reconstruction activities to not only provide better traffic usage; but also to prevent and control erosion from the road surface
- Road drainage controls are being incorporated into designs that are intended to:

- Reduce the erosive flows in ditches by providing frequent cross-drains to relieve ditch flows;
- Avoid water movement down the road by dispersing the drainage quickly by crowning or outsloping the road surface;
- Disperse drainage water (that often carries sediment) onto stable forested slopes before ditches discharge into waterways;
- Ensure new and existing stream crossings safely pass extreme events when constructed or reconstructed (i.e. 100-year flood event).

Designers and planners develop road networks that avoid highly erosive or unstable slopes utilizing the land systems inventory, and the knowledge and experience of hydrologists, soil scientists, and geotechnical engineers. Road treatments include the elimination of ruts, repair of ditches, repair or installation of dips and waterbars, and the replacement of non-functional or undersized culverts.

Citations were reviewed and analyzed based on comments provided. The attachment contain individual quotes from Forest Service leadership directing and emphasizing the importance of using the best available science and detailing the Forest Service efforts to do that. The last 3 citations are in relation to findings of a scientific symposium and two specific projects and are not relevant to the use of best available science in this project.

274. Comment (Commenter 1): Issue #37 ----- Logging Road Construction causes Significant Ecological Harm. Please Analyze an Alternative in Detail that does not Construct any New Roads(temporary or system). Such an alternative is not Unreasonable. Sadly, a connected action to the timber harvest in the Proposed Action is to construct *** miles of new road.

There is enough drive-able road on national forest land to reach the moon and halfway back yet you want more! This is criminal. A no road construction and reconstruction alternative will likely reduce the sale volume slightly. However, it stands out among the possible action alternatives that could be analyzed in detail because it reduces the adverse environmental effects of logging while still meeting the purpose and need for the project.

Comment: Please don't tell me you will not analyze a "no new road" alternative in detail because the P&N will not be met. The P&N does not specify a certain number of treatment acres. The "no new roads" alternative will reduce the acres logged, but will still meet the P&N. You know this.

Comment: Without exception, road construction and reconstruction is an activity that causes damage to some important natural resources in the forest. New road construction is particularly detrimental to aquatic and wildlife resources. Chief Dombeck's statement below supports this fact.

"Roads often cause serious ecological impacts. There are few more irreparable marks we can leave on the land than to build a road."

Dr. Mike Dombeck, Chief, US Forest ServiceRemarks to Forest Service employees and retirees at the University of Montana February 1998

Link to statement:
https://www.uwsp.edu/cnr/gem/Dombeck/MDSpeeches/CD%20COPY/Chief%20Mike%20Dombeck%27s%20Remarks%20to%20Forest%20Service%20Employees%20and%20.htm Opposing Views Attachment #4 contains statements by hundreds of Ph.D. scientists describing Chief Dombeck's observations in greater detail.

Comment: Since best science and Chief Dombeck agree that there are few more irreparable marks we can leave on the land than to build and reconstruct road, this is a valid reason to analyze this alternative in detail.

Response: No permanent new road construction is proposed as part of the King Fire Restoration Project, only road repair and maintenance is proposed. Direction from CEQ is to "Study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources as provided by section 102(2)(E) of the Act" (40 CFR 1501.2(c)).

Reasonable alternatives to the proposed action should fulfill the purpose and need and address unresolved conflicts related to the proposed action. Be alert for alternatives suggested by participants in scoping and public involvement activities. Consider alternatives, even if outside the jurisdiction of the Agency (FSH 1909.15).

Watershed

275. Comment (Commenter 1): Issue #14 ----- The DEIS does not contain recent (emphasis added) stream survey data that is essential to determine whether the stream conditions were harmed by timber sale activities. The only way to determine this is before and after measurements which require survey data before the timber sale is implemented.

The Proposed Action map shows many cutting units either adjacent to perennial streams or has perennial streams running through the cutting units. The Proposed Action roads map shows proposed locations for temporary roads crossing perennial streams. RCA buffers.

Any competent fisheries biologist would insist that stream surveys must be taken before logging and road construction occurs to measure stream temperature and turbidity. These data would then be compared with measurements at the same locations taken during logging and road construction.

The DEIS fails to describe the process of comparing measurable stream data (i.e. temperature, turbidity etc.) taken during monitoring field trips while logging is occurring with the same data taken before logging. This is not done because you know what the comparison will show.

Request for changes to be made to the final NEPA document: Include the measured results of recent stream surveys and display a stream monitoring schedule to be completed during and immediately following sale closure.

Response: We understand the Proposed Action map shows cutting units either adjacent to perennial streams or streams running through the cutting units. However, Table 2.14 of the FEIS describes in detail the buffers and requirements for the protection of streams and RCAs. Table 2.15 describes additional measurements for the protection of streams. Chapter 3 of the DEIS (Watersheds, starting on page 3-166) includes detailed discussions and analysis of watersheds and stream protection measures. The methodology used is described below:

- Field Evaluation – many proposed treatment units, streams, and RCAs were evaluated by a hydrologist, soil scientist and technicians, aquatic biologist, and/or botanist. Due to time restrictions and the large project area, not all proposed treatment units or RCAs were visited.
- Literature Review – a thorough review of the literature was conducted on the impacts of the proposed actions to hydrologic resources.
- GIS Analysis – GIS was used for spatial analysis, including use of satellite imagery and access to forest databases.

- Monitoring – A review of BMP monitoring results on the ENF was conducted. These results were useful in predicting the impacts of management activities and associated BMPs on hydrologic resources.
- Cumulative Watershed Effects Model – The ERA method is used by the Pacific Southwest Region of the FS to assess cumulative watershed effects of the alternatives. See Appendix J for a detailed explanation of the ERA model.

276. Comment (Commenter 1): Issue #15 ---- Increases in logging on the national forest do not stabilize or enhance the economy of small communities located near national forests. One of your purposes listed in the P&N at page 1-5 for this timber sale is:

"Expeditiously recover timber killed by the fire commensurate with available markets for the purpose of generating funds to offset the cost of restoration activities and contribute to societal needs for wood products"

The IDT members include this in their P&N knowing it's a commonly used excuse intending to convince the public the sale is needed. This need is only legitimate if an analysis of the volume under contract is low and the recreation/tourism related businesses in the local communities don't generate much money or employ many people.

Consider the following excerpts from a research paper that examined community stability vs. increased logging. The study was done on small communities near national forests in Washington State:

"The relationship between timber harvest and the overall economic health of Washington communities assumed to be most dependent on logging and forest products runs counter to commonly held assumptions."

"Despite a 93 percent decline in National Forest timber harvests and the loss of 7,300 forest products jobs statewide between 1988 and 1998, the number of people employed outside of forest products expanded by 726,000 (total employment increased 33 percent), total real income expanded by almost 50 percent, and population rose by 23 percent."

"Economic vitality was especially evident in the largely non-metropolitan counties adjacent to National Forest lands in eastern and southwestern Washington. Although 3,000 forest products jobs were lost, more than 170,000 jobs were added outside that sector. The counties adjacent to the National Forests were not driven into economic depression as a result of 70 to 90 percent declines in federal harvests. Instead, average real income, employment, and population expanded significantly."

"Even within relatively isolated areas, such as the northeastern tier of counties, there was considerable economic vitality despite the declines in federal timber harvests. In general, all areas gained population at rates above the national average. Some areas, such as Okanogan County, did almost as well as the state's metropolitan areas despite the decline in federal harvests."

"The relatively high unemployment rates in many of the eastern Washington counties adjacent to National Forests cannot be attributed to the decline in federal harvests. Those counties had even higher unemployment rates at the time of peak harvests in the late 1980s. The unemployment rates in excess of the state average did not rise as federal harvests fell dramatically from these peak levels."

"While its true that average real pay is low in the eastern and southwest Washington

counties adjacent to National Forests, this low pay is not the result of the decline in federal harvests. Average real pay plunged during the 1980s while federal harvests were rising to peak levels. In fact, while federal harvests fell in the 1990s, average pay stabilized or increased."

"Federal payments to local governments from revenue generated by local National Forest lands declined with federal harvests during the 1990s. This, however, did not cause an overall decline in the revenues available to local governments. Local and state economic vitality allowed local government revenues to double in the 1990s despite the reduction of the National Forest contributions."

From "*The Economic Impact of Preserving Washington's Roadless National Forests*" by Thomas Michael Power, Ph.D., Professor of Economics, University of Montana, June 13, 2000.

Links to complete article: http://www.kettlerange.org/power/ExecSummary.htm

http://www.kettlerange.org/power/powerreport.htm

ECONorthwest reached conclusions similar to those of Dr. Power quoted above:

"(1) Despite years of rhetoric and misinformation, national and regional economies are not dependent on logging National Forests. The most often cited misconception is that the regional economy of the Pacific Northwest declined after a court injunction and related events reduced National Forest logging. In fact, instead of collapsing, the region's economy expanded and the Pacific Northwest weathered virtually unscathed the national economic recession that occurred at the same time as the court injunction.

(2) National Forests now produce goods and services that are much more significant than the value of logging.

(3) The Forest Service logging program has caused devastating impacts in the ability of the National Forests to provide economically valuable goods and services. Reversing the damage caused by logging will be costly but ignoring the need to restore damaged forests will cost even more."

From: EcoNorthwest, "Seeing Forests for their Green: Economic Benefits of Forest Protection, Recreation, and Restoration", August 13, 2000

http://econw.com/our-work/publications/seeing-forests-for-their-green-economic-benefits-of-forest-protection-recre/

U.S. Undersecretary of Agriculture Jim Lyons states that recreation revenues from national forests significantly exceed timber revenues. Please see:

http://www.americantrails.org/resources/economics/EconForestRec.html

Also see this compelling information:

http://illinois.sierraclub.org/piasapalisades/factshee.htm

Here's more from the Portland *Oregonian*:

"Increased logging on federal lands will not fix these problems. Instead, it will diminish jobs in one of Oregon's fastest growing industries, outdoor recreation. The outdoor recreation industry employs about 140,000 workers in Oregon (logging and wood-products manufacturing employ fewer than 30,000). Nationally, jobs in outdoor recreation are growing 5 percent annually. High-quality recreation attracts middle- and high-income families to settle in rural counties, too, boosting local economic activity. There is abundant

research and data showing that our federal forests would do far more for workers, families and local businesses if managed for ecosystem and human health rather than as tree farms."

From: Logging expansion won't help rural communities

Portland *Oregonian* online, June 29, 2014

http://www.oregonlive.com/opinion/index.ssf/2014/06/logging_expansion_wont_help_ru.html

They all make the case that 1) recreationists avoid areas that have been logged, and 2) recreation-related revenues to local communities with lumber mills is much more than the revenues generated by logging?

Response: The Eldorado National Forest Land and Resource Management Plan provides direction to maintain a range of recreation experiences since existing classes vary between Management Areas and to keep the Recreational Opportunity Spectrum levels at the approved class in the Recreation Opportunity Spectrum Inventory. This project is not expected to negatively impact the local businesses by reducing opportunities for recreational experiences on the Forest through proposed salvage treatments in the project area.

277. Comment (Commenter 1): You reject the research conclusions of 241 Ph.D. scientists quoted in Opposing Views Attachment #1 who demonstrate how logging-related harm (and in a few cases destruction) is inflicted on multiple natural resources in and near the sale area. Incredibly, you rely on the advice of 3 or 4 timber employees financially motivated to sell timber. You know the log for community stability P&N statement appears in at least 80% of all timber sale NEPA documents. This has become the commonly used excuse by USFS line-officers to sell unneeded timber sales and you use it here.

Response: The comments above were reviewed, and consist of short quotations from various sources, including quotations from the scientific gray literature, primary science, and popular press. The opposing views were reviewed to determine which opposing views were related to the comments provided by the interested party. Opposing views not related to the King Fire FEIS were not considered in greater depth.

278. Comment (Commenter 1): Comment: If you were really concerned about local community stability and local job creation you would offer this sale as an SBA sale to prevent a large timber corporation from logging it using their own labor and to prevent the logs from being hauled many miles to be processed at a mill far removed from the small communities you claim to help. Of course your motivation to sell this timber sale has nothing to do with community stability. We both know "local community stability" and "local job creation" is part of the USFS dishonest script to trick the public into accepting tragic timber sales.

Comment: Dr. Power conducted research to validate or disprove whether increased timber harvest will enhance and strengthen the economic stability of communities located near national forests in Washington state. His research shows that logging levels are inversely proportional to community stability. Your DEIS fails to tell the public why Dr. Powers' research conclusions are not applicable to the communities near the Eldorado National Forest.

Request for changes to be made to the final NEPA document: Either:

1) remove the following statement from the P&N:

"Expeditiously recover timber killed by the fire commensurate with available markets for the purpose of generating funds to offset the cost of restoration activities and contribute to societal needs for wood products" OR

2) offer the sale as an SBA sale, OR

3) include the following papers (referenced above) in their entirety in an Appendix to the NEPA document. Line-officers must not withhold such important information from the public. Congress promulgated laws to prevent zealous federal officials from behaving in such a manner to feather their nest.

"The Economic Impact of Trails-Forest Recreation's Growing Impact"

"Seeing Forests for their Green: Economic Benefits of Forest Protection, Recreation, and Restoration",

"*The Economic Impact of Preserving Washington's Roadless National Forests*"

Response: The comments above were reviewed, and consist of short quotations from various sources, including quotations from the scientific gray literature, primary science, and popular press. The opposing views were reviewed to determine which opposing views were related to the comments provided by the interested party. Opposing views not related to the King Fire FEIS were not considered in greater depth.

Wildlife

279. Comment (Commenter 1): Issue #7 ----- The DEIS does not discuss how the timber sale's logging and slash/RX burning activities will be mitigated to assure protected bird species' individuals and their habitat are not harmed in any way. It is not only possible but highly likely that that logging will:

- harm cavity-nesting birds with logging-related pollution,
- detrimentally alter the bird's habitat,
- environmentaly degrade the area surrounding the bird's habitat, and
- kill bird chicks by destroying their nests or eggs.

Request for changes to be made to the final NEPA document: Identify the birds that exist in and near the project area that are protected under the Migratory Bird Treaty Act and discuss how these birds will be protected during burning and timber harvest operations. The Act makes no allowance to consciously harm these birds for any reason.

Response: Under the National Forest Management Act (NFMA), the Forest Service is directed to "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives." (P.L. 94-588, Sec 6 (g) (3) (B)). The January 2000 USDA Forest Service (FS) Landbird Conservation Strategic Plan, followed by Executive Order 13186 in 2001, in addition to the Partners in Flight (PIF) specific habitat Conservation Plans for birds and the January 2004 PIF North American Landbird Conservation Plan all reference goals and objectives for integrating bird conservation into forest management and planning.

In late 2008, a Memorandum of Understanding between the USDA Forest Service and the US Fish and Wildlife Service to Promote the Conservation of Migratory Birds was signed. The intent of the MOU is to strengthen migratory bird conservation through enhanced collaboration

and cooperation between the Forest Service and the Fish and Wildlife Service as well as other federal, state, tribal and local governments. Within the National Forests, conservation of migratory birds focuses on providing a diversity of habitat conditions at multiple spatial scales and ensuring that bird conservation is addressed when planning for land management activities.

Specific bird species are not identified and addressed in the FEIS for management. The FEIS analyzes and addresses the effects of project activities on migratory birds. The likely impacts to habitats and select migratory bird populations resulting from the King Fire Restoration Project were assessed within the project MTBA Report which is included in the project file and available upon request.

Furthermore, direction to maintain the viability of Region 5 sensitive species is provided by the National Forest Management Act, the Code of Federal Regulations (219.19), the Forest Service Manual (2672), and the Eldorado National Forest Land and Resource Management Plan (LRMP). The Sierra Nevada Forest Plan Amendment (SNFPA - USDA Forest Service 2004) amends the Eldorado National Forest LRMP.

Direction from 1909.15 states that "for each alternative considered in detail, analyze and document the environmental effects, including the effectiveness of the mitigation measures that would result from implementing each alternative, including the no-action alternative". Disclosure of impacts to wildlife in the Terrestrial and Aquatic BE/BAs is consistent with NEPA requirement. The potential for negative impacts to wildlife habitat and the risk of mortality to individuals is discussed and disclosed in the reports and is summarized in Chapter 3 of the FEIS.

Other

280. Comment (Commenter 1): *"Our government is like a rich and foolish spendthrift who has inherited a magnificent estate in perfect order, and then has left his fields and meadows, forests and parks, to be sold and plundered and wasted."*

"Every other civilized nation in the world has been compelled to care for its forests, and so must we if waste and destruction are not to go to the bitter end, leaving America as barren as Palestine or Spain." **John Muir August 1897**

"Only after the last tree has been cut down; only after the last river has been poisoned; only after the last fish has been caught; only then will you find that money cannot be eaten!" **Chief Seattle**

*"We must protect the forests for our children, grandchildren and children yet to be born. We must protect the forests for those who can't speak for themselves such as the birds, animals, fish and trees."***Qwatsinas - (Hereditary Chief Edward Moody), Nuxalk Nation**

The proposed King Fire Salvage timber sale shows John Muir had exquisite abilities to predict the future 117 years ago. This tragic project shows that in the 53 years since the national forests were created, an agency decision-maker like you still refuses to respect/admire Nature's exquisite qualities. Nature must never be manipulated and desecrated by humans for money as you propose to do. Nature's bounty is priceless to most Americans who pay your salary and trust you to care for and protect the wildlife, scenery and clean water. Of course now you have entered your denial mode thinking "here's another disgruntled, retired USFS employee."

I saw it myself during my 31 years with the USFS. Here are the facts. The agency routinely and repeatedly showers you all with information intended to teach you timber is king and it's your job to create private industrial tree farm conditions in the national forests. They teach you this is good. Their rewards system is based on timber outputs and acres "treated." They euphemize words that might concern the public. Have you ever been curious about the year they replaced the verb "to log" with "to treat?" Have you ever really wondered if planning and offering a

commercial timber sale is the right thing to do? Of course not. The agency stifles original thought-about and inquiry-into the wisdom of logging and roading a natural, biodiverse, un-manipulated, properly functioning forested ecosystem. It's a no-brainer unless you have been subjected to agency mind altering techniques.

Please contemplate why the vast majority (87%+) of the American public are vehemently opposed to logging in their national forests. How can you say you serve the public when you (emphasis added) are responsible for logging their land? Your USFS salary is good but is it worth it? Are you aware that you deposit your ethics and values at the door every morning as you enter the District or supervisor's office building?

I invite you to purchase and read Jim Furnish's new book published earlier this year. It's called *Toward a Natural Forest-the Forest Service in Transition-A Memoir*. Please make it available to your employees. Your IDT members who enthusiastically join you and assist you in your timber sale plunder might also question their own behavior after reading Mr. Furnish's book.

Indeed, Mr. Furnish knows the USFS well:

1968-1976 – forester on the Black Hills NF

1977-1984 – District Ranger on the Bighorn NF

1984-1989 – planning staff on the San Juan NF

1989-1991 – appeals coordinator in the WO

1991-1999 – forest Supervisor on the Siuslaw NF

1999-2002 -- Deputy Chief of the USFS in the WO

Here are several quotes from his book:

"What saddens me is that the head of a once-trusted agency implicitly admitted that its leaders lied and broke the law." (page 11)

"He (Jim Hagemeier) wanted these forests to retain their natural character, not become yet another forest landscape of cookie cutter homogeneity. (page 28)

"For any forester schooled in agency dogma, this meant war. Bureaucratic war anyway. Foresters worked at maximizing timber production, minimizing cost, designing the best logging practices, ensuring a fair price for the sale, and overseeing logging operations toughly but fairly. You log it right, and people will like what they see --- or at least you explain to them that they should like it even if they don't." (pages 28 and 29)

"*How else could I explain seeing, over and over again, the pattern of aggressive logging and road building on national forests aimed at taming these wild lands? Such strong evidence seemed the best indication that the Forest Service created a mission and marshaled the agency's resources to "get the cut out*." " (page 43)

"*Fewer and fewer people accepted sweeping vistas dominated by clear-cuts and new roads. Instead, they valued naturalness, clean water, abundant fish and wildlife, and a deep sense of connection with the land. They were anguished at what the Forest Service was taking from the forest at the expense of future generations."* (pages 113 and 114)

"*A different set of societal values emerged, inviting the agency to change. The failure to respond to this value shift had profound consequences for the Forest Service. How many polls that show 90 of the people hate clear-cuts does one have to read before concluding that it's time to do something different*?" (pages 134 and 135)

"*Similarly, roadless areas had long been regarded by the Forest Service as merely the next place one goes to log more trees*." (page 151)

"*The timber industry, as well as many people in Forest Service leadership, continued to view roadless area protection antithetical of multiple use mandates.*" (page 151)

"*Next, the agency leaders need to explicitly embrace the mandate of ecosystem management, which I would describe as value-driven resource management with a goal of maintaining or achieving naturalness. Primary values should be clean water and air, abundant fish and wildlife, quality recreation opportunities, and sustaining landscape function*." (page 198)

Here is Mr. Furnish's conclusion: *"How much are public forests worth? They are priceless."*

I suggest all USFS employees who wish to learn the truth buy Mr. Furnish's book at:

http://www.towardanaturalforest.com/

Unfortunately, this is not the case here. The IDT members should hang their heads in shame and never again entertain the notion that they are "public servants." A responsible IDT member with ethics and values would refuse to be associated with a post-fire timber sale. They must investigate real science written by experts not associated with the corrupt USFS. I wonder why they look the other way and pretend that such science does not exist. Here's an example:

"Although logging and replanting may seem like a reasonable way to clean up and restore forests after disturbances like wildland fires, such activity would actually slow the natural recovery of forests and of streams and creatures within them.'

"Many scientist-reviewed studies and syntheses (please see the selected citations appended to this letter) have recently come to this conclusion. For example, no substantive evidence supports the idea that fire-adapted forests might be improved by logging after a fire. In fact, many carefully conducted studies have concluded just the opposite. Most plants and animals in these forests are adapted to periodic fires and other natural disturbances. They have a remarkable way of recovering - literally rising from the ashes - because they have evolved with and even depend upon fire."

"In testimony before the House Subcommittee on Resources (November 10, 2005), eminent forest ecologist and University of Washington Professor Jerry Franklin noted that logging dead trees often has greater negative impacts than logging of live trees. He concluded that "timber salvage is most appropriately viewed as a 'tax' on ecological recovery." Beyond those concerns, post-disturbance logging often intensifies the potential severity of future fires by concentrating the slash from logging at or near the ground. Rather than leaving plant material standing - and providing perching, nesting, and feeding sites for wildlife - such logging abruptly moves the material to the ground. Most of this material would naturally fall to the ground, adding important supplies of nutrients and energy to the forest floor and structure in the form of woody debris to stream channels. But this naturally happens over decades, not in the relatively short time associated with a logging operation."

From an August 1, 2006 letter to members of Congress

http://www.conservationnw.org/library/otherpub/document-2006-03-15-7573536098

The 169 Ph.D. Scientists who signed this letter to Congress are:

Abbott, Isabella A. Ph.D., Paul Alaback, Ph.D., William S. Alverson, Ph.D., Richard F. Ambrose, Ph.D., Loren Ammerman, Ph.D., James P. Amon, Ph.D., Thomas H. Anderson, Ph.D., William D. Anderson, Jr., Ph.D., Robert Angus, Ph.D., Joseph E. Armstrong, Ph.D., Richard G. Baker, Ph. D., Richard H. Baker, Ph.D., William L. Baker, Ph.D., Bruce G. Baldwin, Ph.D., Raymond

Barbehenn, Ph.D., Linda Sue Barnes, Ph.D., Frank Barnwell, Ph.D., James Barron, Ph.D., Paul E. Bartelt, Ph.D., Andrew M. Barton, Ph.D., Carol J. Baskauf, Ph.D., Peter Bednekoff Ph. D., Paul Beier, Ph.D., Michael A. Bell, Ph.D., Craig W. Benkman, Ph.D., David H. Benzing, Ph.D., May R. Berenbaum, Ph.D., David J. Berg, Ph.D., Brad Bergstrom, Ph.D., Carolyn Bergstrom, Ph.D., Robert L. Beschta, Ph.D., Alfred Beulig, Ph.D., Charles Birkeland, Ph.D., John G. Bishop, Ph.D., David E. Blockstein, Ph.D., Jessica Blois Ph.D., Michael H. Blust, Ph.D., Jane H. Bock, Ph.D., P. Dee Boersma, Ph.D., Stephanie Bohlman, Ph.D., Stephen K. Boss, Ph.D., Reed Bowman, Ph.D., Richard L. Boyce, Ph.D., David Barton Bray, Ph.D., Richard A. Bradley, Ph.D., Steven W. Brewer, Ph.D., Martin R. Brittan, Ph.D., William R. Bromer, Ph.D., Lincoln P. Brower, Ph.D., David Brown, Ph.D., Greg Brown, Ph.D., Ken Brown, Ph.D., Milford Brown, Ph.D., Deborah Buitron, Ph.D., Abel Bult-Ito, Ph.D., Tom Bultman, Ph.D., Robyn J. Burnham, Ph.D., Ramona J. Butz Ph.D, James Byers, Ph.D., Bernard H. Byrnes, Ph.D., Diane Campbell, Ph.D., Philip D. Cantino, Ph.D., Ken Carloni, Ph.D., John L. Carr, Ph.D., C. Ronald Carroll, Ph.D., Georgia Bobb Carson, Ph.D., Kefyn M. Catley, Ph.D., Christopher Chabot, Ph.D., Kai M. A. Chan, Ph.D., F. Stuart Chapin, III, Ph.D., Robin L. Chazdon, Ph.D., Anita F. Cholewa, Ph.D., David Christophel, Ph.D., Barbara J. Clement, Ph.D., Robert C. Clover, Ph.D., Robert Coats, Ph.D., Coblentz, Ph.D., Martin L. Cody, Ph.D., William J. Cohen, Ph.D., Robert K. Colwell, Ph.D., Marty Condon, Ph.D., Laura E. Conkey, Ph.D., Ian M. Cooke, Ph.D., Clay E. Corbin, Ph.D., John Costello, Ph.D., Bruce C. Cowell, Ph.D., Lance Craighead, Ph.D., T. Patrick Culbert, Ph.D., David A. Culver, Ph.D., Amanda Curtin, Ph.D., Ana Davidson, Ph.D., Paul Dayton, Ph.D., Amrita G. de Soyza, Ph.D., James E. Deacon, Ph.D., D. Robert Deal, Ph.D., Kelly Decker, Ph.D., Kevin J. Delaney, Ph.D., Dominick A. DellaSala, Ph.D., DeLuca, Ph.D., Saara J. DeWalt, Ph.D., David S. Dobkin, Ph.D., Richard J. Douglass, Ph.D., Jean Dubach, Ph.D., Tom Dudley, Ph.D., Scot Duncan, Ph.D., Peter W. Dunwiddie, Ph.D.,Phillip Dustan, Ph.D.,L. L. Eberhardt, Ph.D.,Vincent M. Eckhart, Ph.D., Patrick M. Eggleston, Ph.D., William R. Engels, Ph.D., J.H. Epler, Ph.D., Jonathan P. Evans, Ph.D., Margaret Evans, Ph.D., Douglas Eveleigh, Ph.D., Christopher Farmer, Ph.D., Melissa K. Fierke, Ph.D., Thomas L. Fleischner, Ph.D., Erica Fleishman, Ph.D., R. Wills Flowers, Ph.D., George W. Folkerts, Ph.D., Joseph Fortier, Ph.D., Elizabeth A. Forys, Ph.D, Brian Foster, Ph.D., Lee E. Frelich, Ph.D., Terrence J. Frest, Ph.D., Chris Frissell, Ph.D., Jed Fuhrman, Ph.D., Alder Fuller, Ph.D., George J. Gamboa, Ph.D., Timothy J. Gaudin, Ph.D., Thomas M. Gehring, Ph.D., Donald Geiger, S.M., Ph.D., Bob Gillespie, Ph.D., Frank S. Gilliam, Ph.D., Rosanna Giordano, Ph.D., Travis C. Glenn, Ph.D., Michale Glennon, Ph.D., Enrique Gomezdelcampo, Ph.D., David L. Gorchov, Ph.D., Steven Green, Ph.D., Gary K. Greer, Ph.D., Carole S. Griffiths, Ph.D., John S. Gunn, Ph.D., James Haas, Ph.D., Stacey Halpern, Ph.D., Steven Hamburg, Ph.D., Michael Hamilton, Ph.D., Alexander H. Harcourt, Ph.D., James A. Harding, Ph.D., Annita Harlan, Ph.D., Marilyn M. Harlin, Ph.D., David D. Hart, Ph.D., John Harte, Ph.D., Mary Ellen Harte, Ph. D., David Hastings, Ph.D., Robert T. Heath, Ph.D., Brooke Parry Hecht, Ph.D., Ken R. Helms, Ph.D., Richard T. Holmes, Ph.D., Marcel Holyoak, Ph.D., Michael H. Horn, Ph.D., Thomas R. Horton, Ph.D., G.F. Hrusa, Ph.D., Robert Huber, Ph.D., Jarvis E. Hudson, Ph.D., Robert M. Hughes, Ph.D., Richard Hutto, Ph.D., G. J. Ikenberry, Ph.D., Timothy Ingalsbee, Ph.D., Haruhiko Itagaki, Ph.D., Daniel H. Janzen, Ph.D., Douglas L. Jeffries, Ph.D., David G. Jenkins, Ph.D., Bart R. Johnson, Ph.D., Laura E. Jones, Ph.D., James R. Karr, Ph.D., Sterling C. Keeley, Ph.D., Barbara A. Knuth, Ph.D., Walter D. Koenig, Ph.D., Sally Gregory Kohlstedt, Ph.D., Loraine U. Kohorn, Ph.D., Julie E. Korb, Ph.D., Fred Kraus, Ph.D., Shawn Kuchta, Ph.D., Melinda Laituri, Ph.D., Rick Landenberger, Ph.D., Patrick Leacock, Ph.D., Christopher A. Lepczyk, Ph.D., Simon Levin, Ph.D., Joyce N. Levine, PhD, William Z. Lidicker, Jr., Ph.D., Gene E. Likens, Ph.D., Creighton M. Litton, Ph.D., Dale R. Lockwood, Ph.D., John P. Loegering, Ph.D., Kathleen LoGiudice, Ph.D., Marilyn D. Loveless, Ph.D., Bruce Lyon, Ph.D., William Mackay, Ph. D., Jason MacKenzie, Ph.D., Julie Maier, Ph.D., Martin B. Main, Ph.D., Julin Maloof, Ph.D., Robert E. Marra, Ph.D., Laura Marx, Ph.D., John M. Marzluff, Ph.D., Glenn Matlack, Ph.D., Brady J. Mattsson, Ph.D., William W. Mautz, Ph.D., Ph.D., Brian McCarthy,

Ph.D., Charles A. McClaugherty, Ph.D., Dale A. McCullough, Ph.D., Mara A. McDonald, Ph.D., William H. McDowell, Ph.D., Amy B. McEuen, Ph.D., Daniel J. McGarvey Ph.D., Patrick McGuire, Ph.D., William O. McLarney, Ph.D., K. W. McLeod, Ph.D., Jack D. McMillen, Ph.D., Scott McNaught, Ph.D., Michael J. Medler, Ph.D., Robert J. Meese, Ph.D., Gary K. Meffe, Ph.D., Robert W. Merriam, Ph.D., J.P. Michaud, Ph.D., Anne Millhollen, Ph.D., Arlee Montalvo, Ph.D., Richard R. Montanucci, Ph.D., Peter B. Moyle, Ph.D., P.H. Mulder, Ph.D., Dennis D. Murphy, Ph.D., K. Greg Murray, Ph.D., Michael P. Murray, Ph.D., Philip Myers, Ph.D., Dhruba Naug, Ph.D., William D. Newmark, Ph.D., Barry R. Noon, Ph.D., Elaine Norman, Ph.D., Elliott A. Norse, Ph.D., Gretchen North, Ph.D., Reed Noss, Ph.D., Gary Nuechterlein, Ph.D., Mary O'Brien, Ph.D., Kathleen O'Reilly, Ph.D., Dennis C. Odion, Ph.D., Erin O'Doherty, Ph.D., Richard R. Old, Ph.D., Guy W. Oliver, Ph.D., Gordon H. Orians, Ph.D., John A. Osborne, Ph.D., Richard S. Ostfeld, Ph.D., A. O. Pacheco, Ph.D., Joel E. Pagel, Ph.D., Lydia C. Pan, Ph.D., Michael Parke, Ph.D., Michael S. Parker, Ph.D., David F. Parkhurst, Ph.D., Arthur Dean Partridge, Ph.D. , Gustav Paulay, Ph.D., Timothy A. Pearce, Ph.D., James L. Pease, Ph.D., J. Akers Pence, Ph.D., David Perry, Ph.D., Kimberly A. Peters, Ph.D., F. A. Pinkham, Ph.D., Jay Pitocchelli, Ph.D., J. Dan Pittillo, Ph.D., Mechthild Pohlschroder, Ph.D., Ellen Popodi, Ph.D., Jennifer E. Price, Ph.D., Anne Pusey, Ph.D., Robert Michael Pyle, Ph.D., G. S. Rahi, Ph.D., Jan A. Randall, Ph.D., Brenda Rashleigh, Ph.D., Richard J. Reiner, Ph.D., Karl J. Reinhard, Ph.D., Bradford G. Rence, Ph.D., Ann F. Rhoads, Ph.D., Cecil F. Rich, Ph.D., David I. Richard, Ph.D., Lisa Richardson-Calfee, Ph.D., Dan L. Richter, Ph.D., Brett R. Riddle, Ph.D., Catherine Riseng, Ph.D., David W. Roberts, Ph.D., Carlton L. Rockett, Ph.D., Gary W. Roemer, Ph.D., William Rogers, Ph.D., Sievert Rohwer, Ph.D., Thomas P. Rooney, Ph.D., Stephen T. Ross, Ph.D., John T. Rotenberry, Ph.D., Steve Rothenberger, Ph.D., Betsie B. Rothermel, Ph.D., Stephen I. Rothstein, Ph.D., Barbara A. ("Bitty") Roy, Ph.D., Suzanne M. Royer, Ph.D., Cristina Rumbaitis del Rio, Ph.D., James Runkle, Ph.D., Sam Rushforth, Ph.D., James R. Ruzycki, Ph.D., Carl Safina, Ph.D., D. Scott Samuels, Ph.D., Sahotra Sarkar, Ph.D., Raymond A. Saumure, Ph.D., Melissa Savage, Ph.D., John F. Schalles, Ph.D., Joseph R. Schiller, Ph.D., Andrew Schnabel, Ph.D., Tania Schoennagel, Ph.D., Robert L. Schooley, Ph.D., Tim Seastedt, Ph.D., Jack A. Seilheimer, Ph.D., Semken, Ph.D., Ruth G. Shaw, Ph.D., Kathleen L. Shea, Ph.D., Brian R. Shmaefsky, Ph.D., George Sideris, Ph.D., Miles R. Silman, Ph.D., Tony Silvaggio, Ph.D., Rebecca Simmons, Ph.D. Assistant Professor Department of Biology University of Carol Skinner, Ph.D., Diane E. Sklensky, Ph.D., Stephen A. Skrabal, Ph.D., Shawn Smallwood, Ph.D., Bryce E. Smith, Ph.D., David L. Smith, Ph.D., Gerald Smith, Ph.D., Jennifer Smith, Ph.D., Sherilyn G. F. Smith, Ph.D., Erica Smithwick, Ph.D., Paul Sneed, Ph.D., Anthony Snider, Ph.D., Eric B. Snyder, Ph.D., Tex A. Sordahl, Ph.D., Wayne D. Spencer, Ph.D., Timothy P. Spira, Ph.D., James R. Spotila, Ph.D., Richard Steiner, Ph.D., Robert Stiles, Ph.D., Glenn R. Stewart, Ph.D., Paul M. Stewart, Ph.D., Richard Strathmann, Ph.D., James R. Strittholt, Ph.D., Mel Sunquist, Ph.D., Samuel S. Sweet, Ph.D., Michael C. Swift, Ph.D., William A. Szelistowski, Ph.D., Robert Tafanelli, Ph.D., David Tallmon, Ph.D., David Winship Taylor, Ph.D., Stephen T. Tettelbach, Ph.D., Guy A. Thompson, Jr., Ph.D., Tamara Ticktin, Ph.D., Brian N. Tissot, Ph.D., A. Spencer Tomb, Ph.D., David W. Tonkyn, Ph.D., Vicki Tripoli, Ph.D., Stephen C. Trombulak, Ph.D., William J. Trush, Ph.D., Robin Tyser, Ph.D., Michael Van Clef, Ph.D., Thomas T. Veblen, Ph.D., Kristin Vessey, Ph. D., Frank von Hippel, Ph.D., Floyd Waddle, Ph.D., Robert O. Wagner, Ph.D., D. Alexander Wait, Ph.D., Don Waller, Ph.D., B. Michael Walton, Ph.D., Richard T. Ward, Ph.D., James H. Warner, Ph.D., Vicki Watson, Ph.D., Beth Wee, Ph.D., Judith S. Weis, Ph.D., Raymond R. White, Ph.D., Walter G. Whitford, Ph.D., Sue Wick, Ph.D., Jack E. Williams, Ph.D., Jerry Woolpy, Ph.D., J. Timothy Wootton Ph.D., Ruth D. Yanai, Ph.D., and Thomas M. Yuill, Ph.D.

Response: Comment noted. In the Decision Document for this project, the Responsible Official will document how the best available scientific information was used to inform the assessments and decisions made for this project. The Forest Service has reviewed and

considered the opposing science viewpoints provided through the public involvement on this project. All documents referenced in this attachment, unless otherwise noted, are contained in the Project File.

There are multiple objectives to the King Fire Restoration Project which go beyond salvage logging alone. The stated purposes are to:

1. Reduce the risk from falling dead, dying, and damaged trees that pose a significant safety concern to forest visitors and workers and which create a hazard to private property, infrastructure, and cultural resources.
2. Remove dead trees in strategic fire management areas to improve the agency's ability to manage and control future fires.
3. Actively manage severely burned areas to facilitate restoration and resilience.
4. Balance active management with the retention of important attributes of post-fire habitat at the landscape scale and within treatment areas to support the diversity and abundance of species.
5. Expeditiously recover timber killed by the fire commensurate with available markets for the purpose of generating funds to offset the cost of restoration activities and contribute to societal needs for wood products.
6. Promote scientific research to increase knowledge regarding the effects of large fires on the environment, how to reduce the risk of future fires, and how to restore resilient forests after fires.

The commenter has submitted information with potentially opposing scientific views from those used to develop and analyze the project. This information is reviewed and analyzed where it is referenced.

We agree that best available science should be used to design and evaluate Forest Service actions. The best available science was used to design the project activities and to evaluate the positive and negative effects of project actions on individual resources. Every action including no action has an effect on Forest resources. The purpose of the King Fire EIS is to display and document those effects to inform a decision. In addition to literature cited in the FEIS, there are references in specialist reports and documents incorporated by reference. Opposing scientific opinions have been acknowledged and evaluated where presented.

Citations in Attachment 15 were reviewed and analyzed based on comments provided. Attachment 15 contains 17 individual quotes from Forest Service leadership directing and emphasizing the importance of using the best available science and detailing the Forest Service efforts to do that. The last 3 citations are in relation to findings of a scientific symposium and two specific projects and are not relevant to the use of best available science in this project.

Ethical conduct of employees regarding personal financial interests are regulated through: gifts from outside sources (subpart b - 5 CFR 2635.201-205), conflicting financial interests (subpart d - 5 CFR 2635.401-403), and impartiality in performing official duties (subpart e - 5 CFR 2635.501-503. The purpose and need for the project is described in the EIS for the project. Employees financially benefiting from the sale of Forest Service products would be a violation of ethics codes and regulations that would subject employees suspect of such activities to have their employment terminated and be prosecuted to the full extent of the law.

281. Comment (Commenter 1): Comment: You named your timber sale the "King Fire Restoration Project." What are your qualifications to ignore the USDA Office of Inspector General quoted below? This is not a rhetorical question. "We concluded that commercial timber sales do not meet the criteria for forest restoration" (Pg. 11). Long, Richard D., U.S. Department of Agriculture Office of Inspector General. "Western Region Audit Report: Forest Service National Fire Plan Implementation" *Report No. 08601-26-SF*, November 2001. Link:

http://www.usda.gov/oig/webdocs/08601-26-SF.pdf. Source: Opposing Views Attachment #1 (page 22)

Response: Comment noted. The hiring agency determines whether a job seeker meets the qualifications.

282. Comment (Commenter 1): Here's something that will educate the IDT members: "Summarize, as relevant, information from scoping (Step 4 above). In this summary, highlight decisions your team made regarding possible alternatives and potential mitigations that link to different alternatives. This information should further prove that your team was open to different alternatives, especially any that the public suggested."

"Remember not to be silent about the reasons for considering some alternatives and ignoring others. Silence is a gift to a possible plaintiff. So plan for and provide even a brief rationale about your range of alternatives. Such a discussion is especially important if your EA or EIS includes only a single action alternative. A single action alternative is a risky agency choice, especially if you determine that your EA or EIS is likely to be a high-risk and controversial document."

Range of Reasonable Alternatives, Feature Article, November 2009, by Larry Freeman, PhD

The Shipley Group, *Senior Consultant*, Link:
http://www.shipleygroup.com/news/articles/0911.pdf

Response: Comment noted. The hiring agency determines whether a job seeker meets the qualifications.

283. Comment (Commenter 1): The Administrative Procedures Act directs judges to set aside an agency action if the court determines that the action is "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. § 706(2)(A). An agency that ignores the preponderance of available information and instead makes a Decision on insubstantial, weak, meager evidence provided by people with financial interest in a Decision being decided one way and literature authored by biased, agency employees who know they must never discuss timber sales in a negative way is guilty of violating the APA.

Response: Response to comment documents for the scoping period and this Legal Notice and comment period will be posted online as the commenter has requested. All documents found in the project record are available by request, and can be sent electronically.

Sixty-six scoping comments were received for the King Fire Restoration Project, many of which were supporting the project, some were against, and some requested modifications. A majority of the respondents are residents of El Dorado County and were affected by the King Fire. Several studies have found a high level of public support for salvage logging in communities that have experienced a nearby wildfire, or are located in an area where the risk of wildfire is high (Long et al, 2014).

As discussed on page 6 of the FEIS, extensive public involvement and public outreach occurred throughout the development of the alternatives for this project. The feedback and input from interested parties and participants was integral in the development of the action alternatives. The project file contains records of meetings, field trips, and public notices listed below.

- On November 12, 2014, a field trip took place to the fire area with stakeholders and interested parties to begin discussing post-fire recovery projects and solicit ideas to help develop the proposed action. Stakeholders included State, Federal, and local elected officials and staff, community liaison partners, utility company and water agency representatives, and representatives from industry and environmental groups.
- A Sierra Nevada Conservancy sponsored field trip took place on November 19, 2014, with Forest Service staff, State legislative members and staff, utility company and water agency representations, local elected officials, and other interested stakeholders.

- A meeting was held December 4, 2014, between the interdisciplinary team and interested and affected stakeholders to further discuss elements of the King Fire Restoration Project proposed action.
- The Notice of Intent (NOI) was published December 24, 2014, beginning the formal scoping period.
- Letters were sent to all interested parties with information on the proposed action and scoping period.
- The Forest developed multiple types of media and internet venues for the public to stay informed with the project and offer opportunities to comment, including the King Fire Restoration Schedule of Proposed Actions webpage and information on the Eldorado National Forest website.
- A workshop was held January 13, 2015, to engage and inform the public and solicit scoping comments.
- A scoping meeting with White Meadows community was held on January 5, 2015.
- A meeting with elected officials was held January 13, 2015, to discuss the proposed action.
- A meeting was held January 15, 2015, with agency officials from the Central Valley Water Quality Control Board and the California Department of Fish and Wildlife.
- A presentation and discussion was held at the Amador-El Dorado Forest Forum meeting on January 21, 2015. The forum is a group of forestry professionals, loggers, and citizens interested in forest management.
- A meeting with interested citizens, a County Supervisor, Congressman McClintock's office, and the California Forestry Association was held on February 25, 2015; the topic was concern over not doing enough salvage harvesting.
- A meeting was held on March 2, 2015, between members of the IDT and the Central Valley Water Quality Control Board to discuss their scoping comments.
- Informal discussions between Forest staff and members of Sierra Forest Legacy were conducted to understand and clarify their scoping comments and develop Alternative 3 to address their issues and proposals.
- A public meeting was held March 25, 2015, to preview the alternatives developed in response to scoping. This meeting was covered by both television and print media.

In the Decision Document for this project, the Responsible Official will document how the best available scientific information was used to inform the assessments and decisions made for this project.

The Forest Service has reviewed and considered the opposing science viewpoints provided through the public involvement on this project. All documents referenced in this attachment, unless otherwise noted, are contained in the Project File.

Ethical conduct of employees regarding personal financial interests are regulated through: gifts from outside sources (subpart b - 5 CFR 2635.201-205), conflicting financial interests (subpart d - 5 CFR 2635.401-403), and impartiality in performing official duties (subpart e - 5 CFR 2635.501-503. The purpose and need for the project is described in the EIS for the project. Employees financially benefiting from the sale of Forest Service products would be a violation of ethics codes and regulations that would subject employees suspect of such activities to have their employment terminated and be prosecuted to the full extent of the law.

284. Comment (Commenter 1): Request for changes to be made to the final NEPA document: Include a discussion and supporting data justifying why it's appropriate to take action on public land that the vast majority of the American public does not want to occur.

Issue #9 ----- The American people do not want their national forests logged for ANY (emphasis added) reason. Your salary (and the IDT members' salary) comes from tax dollars supplied by these same Americans you propose to assault. How do you justify backhanding them to serve your corporate masters?

Comment: Even the USFS acknowledges that the public does not want their public lands logged. The following quote comes from a forest service publication that describes what the public wants from their national forests:

"The public sees the restriction of mineral development and of timber harvest and grazing as being more important than the provision of natural resources to dependent communities (although this is still seen as somewhat important)." (Pg. 28)

Source of quote: "Survey results of the American public's values, objectives, beliefs, and attitudes regarding forests and grasslands: A technical document supporting the 2000 USDA Forest Service RPA Assessment". Gen. Tech. Rep. RMRS-GTR-95. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 111 p. Link to Complete Report: http://www.fs.fed.us/rm/pubs/rmrs_gtr095.pdf

In light of this USFS document, how do you justify this timber sale?

Comment: There is no "timber famine" as the USFS has been so fond of predicting for many decades. There is no shortage of raw materials for paper and wood products in the United States. Therefore, there is no reason to have commercial timber sales in the national forests. Only 4.8 % of the raw materials for domestically used wood products and paper come from national forest land. The USFS could stop logging today and the market would never react. The volume would be replaced from private-industrial tree farms and private sources without blinking an eye.

Comment: Over 500 Ph.D. scientists are quoted in Opposing Views Attachments #1 #2 and #4. They describe how and why a post-fire landscape must never be logged and roaded. Why do the scientists' clear and substantiated acknowledgement of massive resource damage caused by timber sales such as yours not apply to the King Fire post-fire Salvage sale?

The discussion should explain why the recommendations of over 500 Ph.D. scientists represented in Opposing Views Attachments #1, #2 and #4 aren't applicable to the King Fire sale area.

Response: The 2004 Sierra Nevada Forest Plan Amendment provides direction for treatment of land allocations. Goals for management include reducing threats to communities and wildlife habitat from large, severe wildfires, increasing stand sustainability by restoring a species composition and structure that is more resilient, and re-introducing fire into fire-adapted ecosystems. The Forest Plan decision includes managing hazardous fuels in and around communities combined with strategic placement of fuels treatments across broad landscapes to modify wildland fire behavior. The desired conditions for the project area and the need for treatment to move landscapes toward that condition were based upon direction in the Forest Plan.

285. Comment (Commenter 1): The King Fire timber sale FEIS at page 7 discusses the "issues" submitted by the public associated with this proposed timber sale. When the public expresses their concern about natural resource harm as part of their comments, they expect the other resource specialists on the IDT who are responsible to protect the natural resources that will likely be harmed to respond with actions to assure the harm does not occur.

The Americans who submitted the rejected comments want to know why and deserve an answer. You and your IDT members indicate the comments were determined to be "non-significant" because they are "outside the scope of the proposed action." How and why are they "outside the scope?"

As if this weren't bad enough, you hide the comments you rejected and the reasons for rejecting them in the project record located at the Eldorado National Forest Supervisor's office. Do you really expect the public to drive hundreds (maybe thousands of miles) to read why you chose to exclude them from the process. The past NEPA documents done on the Eldorado NF did exactly the same thing. The information was hidden in the project file and not posted online. Don't believe me? Read the issues section in the Blacksmith Ecological Restoration EIS and you will see this public abuse again.

2) already decided by law, regulation, Forest Plan, or other higher-level decision;

Comment: The Americans who submitted the rejected comments want to know why and deserve an answer. You and your IDT members indicate the comments were determined to be "non-significant" because they are "law, regulation, Forest Plan, or other higher-level decision." An intelligent, meaningful response to comments rejected for this reason would be to disclose the "law, regulation, Forest Plan, or other higher-level decision." Of course you won't discuss this online because there is nothing you can say that's truthful. You know an honest response to their comments might jeopardize your precious timber sale. What's your solution to this "problem?" Dismiss and spurn the public you claim to serve.

As if this weren't bad enough, you hide the comments you rejected and the reasons for rejecting them in the project record located at the Eldorado National Forest Supervisor's office. Do you really expect the public to drive hundreds (maybe thousands of miles) to read why you chose to exclude them from the process. The past NEPA documents done on the Eldorado NF did exactly the same thing. The information was hidden in the project file and not posted online. Don't believe me? Read the issues section in the Blacksmith Ecological Restoration EIS and you will see this public abuse again.

3) irrelevant to the decision to be made; or

Comment: The Americans who submitted the rejected comments want to know why and deserve an answer. You and your IDT members indicate the comments were determined to be "non-significant" because they are "irrelevant to the decision to be made." How and why are they "irrelevant to the decision to be made?" Of course you won't discuss this online because you know they are clearly relevant. You know an honest response to their comments might jeopardize your precious timber sale. What's your solution to this "problem?" Dismiss and spurn the public you claim to serve.

As if this weren't bad enough, you hide the comments you rejected and the reasons for rejecting them in the project record located at the Eldorado National Forest Supervisor's office. Do you really expect the public to drive hundreds (maybe thousands of miles) to read why you chose to exclude them from the process. The past NEPA documents done on the Eldorado NF did exactly the same thing. The information was hidden in the project file and not posted online. Don't believe me? Read the issues section in the Blacksmith Ecological Restoration EIS and you will see this public abuse again.

4) conjectural and not supported by scientific or factual evidence

Comment: This is the most ridiculous reason to rebuff and disregard the Americans who wish to become involved in the manipulation of their land by a government agency by claiming their comments are "non-significant.". How and where does the Eldorado National Forest inform the public that their comments will be accepted only if the are "supported by scientific or factual evidence?" Of course you don't inform the public. You use this excust to dismiss the public. How handy.

These 4 reasons for rejecting the public are used in this DEIS and ALL previous timber sale NEPA documents prepared on the Eldorado NF. How convenient for the IDT members. They excel at cut & paste analysis.

Describing some issues submitted by American citizen owners of the Eldorado National Forest as "non-significant" as is the case here indicates your unprofessional arrogance and disdain for the public. It shows your willingness to backhand members of the public who even suggest that your sacred timber sale might not be a wise thing to pursue. Tomorrow when you and your IDT members genuflect to corporate America as you enter your office please think about this. How would a real public servant behave?

Request for changes to be made to the final NEPA document: Assure that all (emphasis added) issues identified by the public are listed in the body of the NEPA document posted online. The Responsible Official should discuss each issue and describe why the timber sale will or will not be modified to eliminate any chance that resource harm will occur to the resource at issue. If a public issue is declared to be "non-significant" the Responsible Official's reasoning and explanation for this determination must be posted online and not hidden away in the project record located at the Eldorado National Forest Supervisor's office.

Response: Response to comment documents for the scoping period and this Legal Notice and comment period will be posted online as the commenter has requested. All documents found in the project record are available by request, and can be sent electronically.

Sixty-six scoping comments were received for the King Fire Restoration Project, many of which were supporting the project, some were against, and some requested modifications. A majority of the respondents are residents of El Dorado County and were affected by the King Fire. Several studies have found a high level of public support for salvage logging in communities that have experienced a nearby wildfire, or are located in an area where the risk of wildfire is high (Long et al, 2014).

As discussed on page 6 of the FEIS, extensive public involvement and public outreach occurred throughout the development of the alternatives for this project. The feedback and input from interested parties and participants was integral in the development of the action alternatives. The project file contains records of meetings, field trips, and public notices listed below.

- On November 12, 2014, a field trip took place to the fire area with stakeholders and interested parties to begin discussing post-fire recovery projects and solicit ideas to help develop the proposed action. Stakeholders included State, Federal, and local elected officials and staff, community liaison partners, utility company and water agency representatives, and representatives from industry and environmental groups.
- A Sierra Nevada Conservancy sponsored field trip took place on November 19, 2014, with Forest Service staff, State legislative members and staff, utility company and water agency representations, local elected officials, and other interested stakeholders.
- A meeting was held December 4, 2014, between the interdisciplinary team and interested and affected stakeholders to further discuss elements of the King Fire Restoration Project proposed action.
- The Notice of Intent (NOI) was published December 24, 2014, beginning the formal scoping period.
- Letters were sent to all interested parties with information on the proposed action and scoping period.
- The Forest developed multiple types of media and internet venues for the public to stay informed with the project and offer opportunities to comment, including the King Fire Restoration Schedule of Proposed Actions webpage and information on the Eldorado National Forest website.

- A workshop was held January 13, 2015, to engage and inform the public and solicit scoping comments.
- A scoping meeting with White Meadows community was held on January 5, 2015.
- A meeting with elected officials was held January 13, 2015, to discuss the proposed action.
- A meeting was held January 15, 2015, with agency officials from the Central Valley Water Quality Control Board and the California Department of Fish and Wildlife.
- A presentation and discussion was held at the Amador-El Dorado Forest Forum meeting on January 21, 2015. The forum is a group of forestry professionals, loggers, and citizens interested in forest management.
- A meeting with interested citizens, a County Supervisor, Congressman McClintock's office, and the California Forestry Association was held on February 25, 2015; the topic was concern over not doing enough salvage harvesting.
- A meeting was held on March 2, 2015, between members of the IDT and the Central Valley Water Quality Control Board to discuss their scoping comments.
- Informal discussions between Forest staff and members of Sierra Forest Legacy were conducted to understand and clarify their scoping comments and develop Alternative 3 to address their issues and proposals.
- A public meeting was held March 25, 2015, to preview the alternatives developed in response to scoping. This meeting was covered by both television and print media.

286. Comment (Commenter 1): Issue #28 ----- The Proposed Action will clearly cause the resource degradation and destruction described in the ATTACHMENTS to these comments.

The attachments to these comments present the "responsible" opposing views of between 500 and 600 independent, unbiased Ph.D. biological scientists who describe the resource damage caused by commercial timber sale logging and road construction activities that occur at any location, on any topography, at any elevation, at any time logging takes place.

The King Fire timber sale will cause major damage to non-vegetative natural resources described by over 400 scientists in the Opposing Viewpoint Attachments. Forging ahead with the timber sale with full knowledge of the likely resource damage that the sale will cause indicates 1) weighing the relative value of the natural resources in the area against timber outputs has not been done, and 2) they have not been harmoniously coordinated. Also, since outdoor recreation, watershed, wildlife and fish are adversely affected by the sale, you obviously consider timber more important that these 4 other resources.

Request for changes to be made to the final NEPA document: Include the source literature for particularly relevant science quotes contained in the Opposing Viewpoint Attachments in the References section of the final EIS and cite the quotes contained in the attachments in the body of the final EIS. Indeed, it makes sense for a public servant to present the public with the whole story which includes benefits and drawbacks of project implementation.

Response: The comments quoted in the Opposing Viewpoints Attachments were reviewed, and consist of short quotations from various sources, including quotations from the scientific gray literature, primary science, and popular press. The opposing views were reviewed to determine which opposing views were related to the comments provided by the interested party. Opposing views not related to the King Fire FEIS or the comments provided were not considered in greater depth.

287. Comment (Commenter 1): Issue #29 ----- The DEIS does not discuss the items shown below (c) Possible conflicts between the proposed action and the objectives of federal, regional,

state, and local (and in the case of a reservation, Indian tribe) land use plans, policies and controls for the area concerned. (See §1506.2(d).)

(e) Energy requirements and conservation potential of various alternatives and mitigation measures.

(f) Natural or depletable resource requirements and conservation potential of various alternatives and mitigation measures.

(g) Urban quality, historic and cultural resources, and the design of the built environment, including the reuse and conservation potential of various alternatives and mitigation measures.

Response: FSM 1950 provides direction for the Responsible Official to "ensure that the effects analysis address all legal and regulatory requirements and ensure that the levels of accuracy and precision are consistent with the methods and technology used (40 CFR 1502.16 and 40 CFR 1502.24). The effects analysis for individual resources analyzes the effects of alternatives and shows the tradeoffs of different actions or lack of action. Furthermore, the King Fire Restoration Project EIS addresses short-term uses and long-term productivity and irreversible and irretrievable commitments of resources.

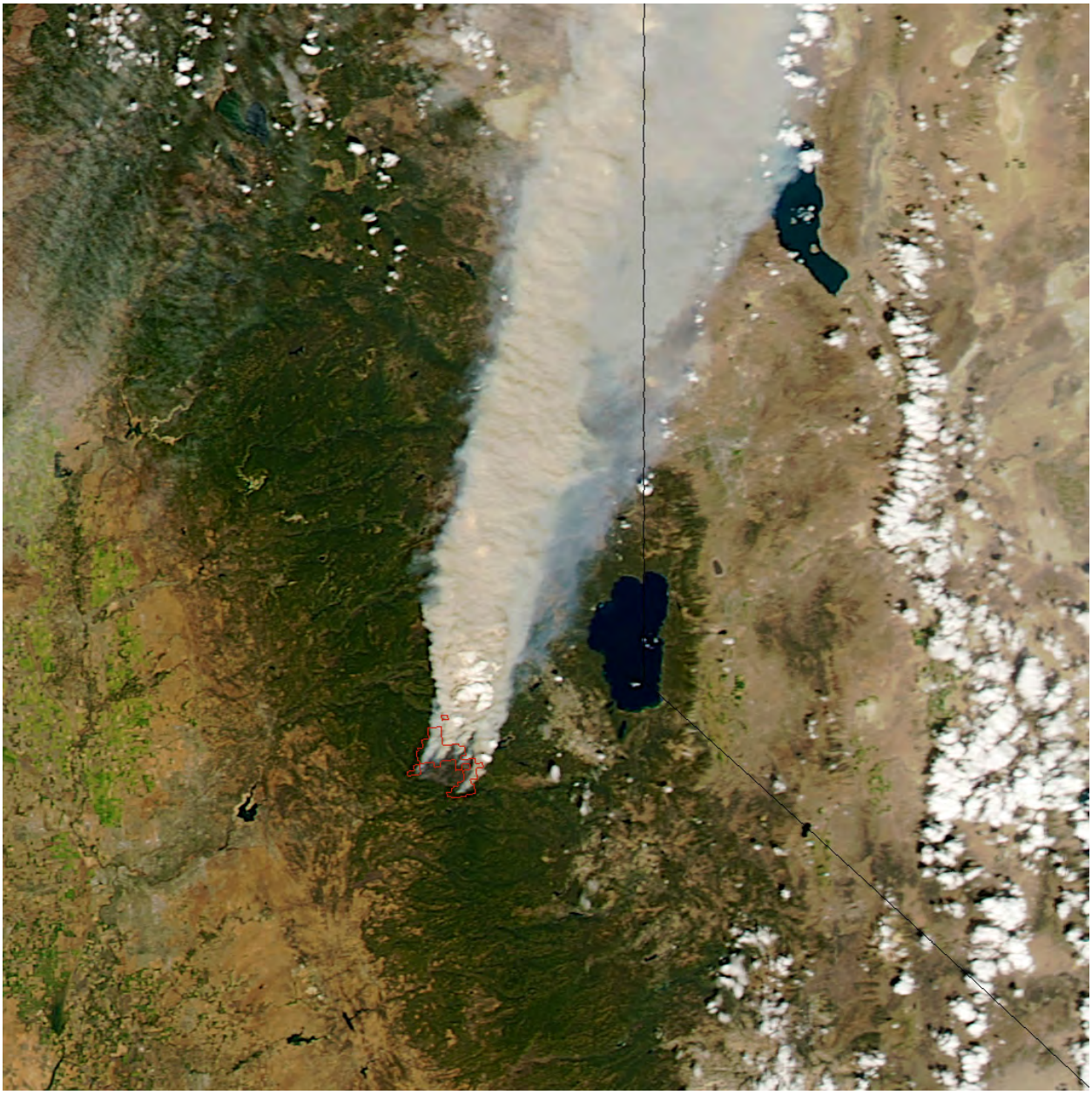
288. Comment (Commenter 1): The children born 50 years from today will not appreciate the ecological plunder caused by this timber sale. Most Americans want future generations of kids to have the opportunity to experience the quietness and solitude in a real, undeveloped forest. This will become more important in 2050 when the predicted population of the United States will be 438 million people. The wild UNDEVELOPED national forests will provide one of the only escapes from the insanity of a world driven even more by money than it is now.

Response: The comments above were reviewed, and consist of short quotations from various sources, including quotations from the scientific gray literature, primary science, and popular press. The opposing views were reviewed to determine which opposing views were related to the comments provided by the interested party. Opposing views not related to the King Fire FEIS were not considered in greater depth. For further discussion see tables for attachments 1, 2, 4, 5, 8, 9a, 14 and 15.

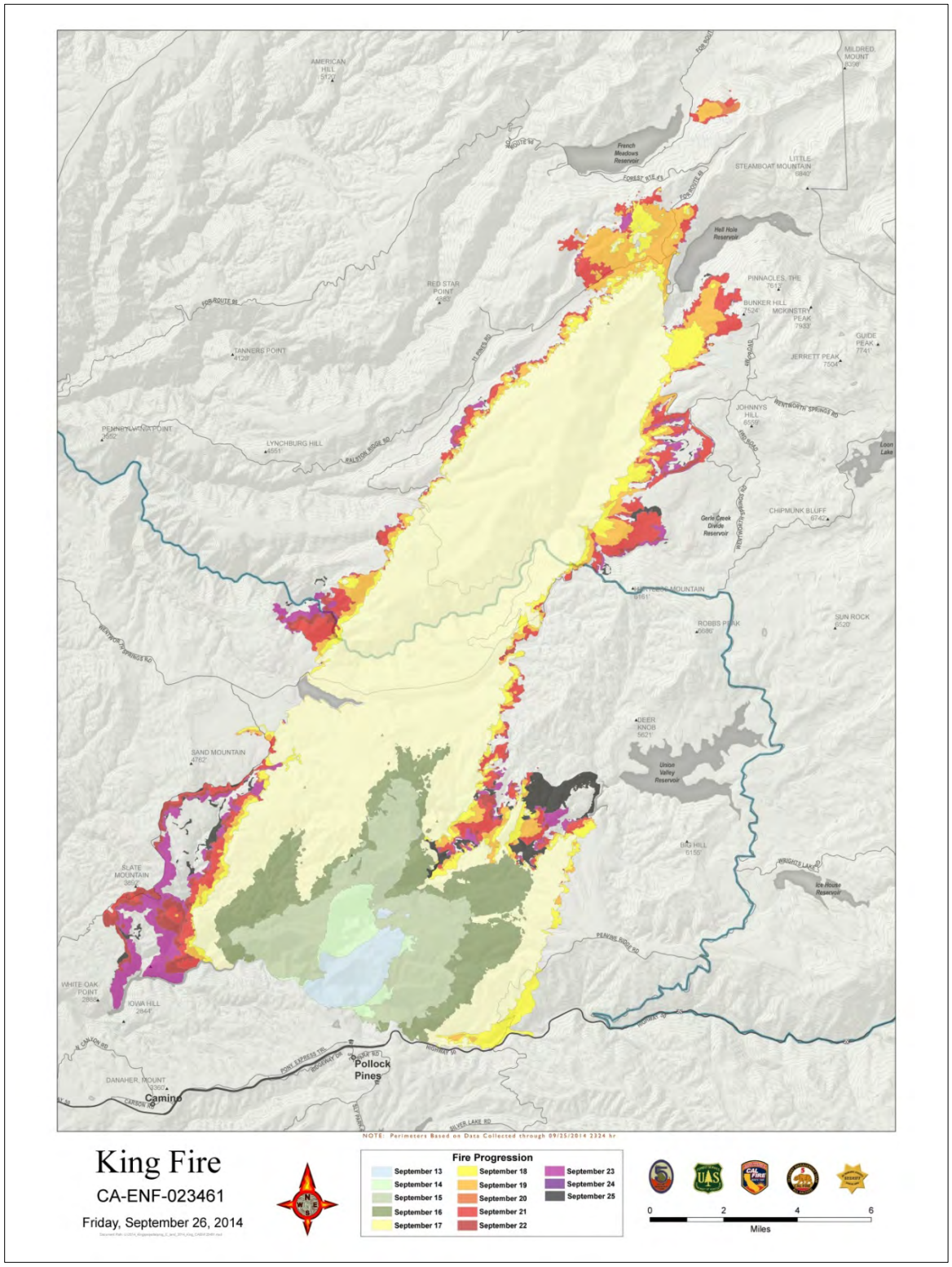
Appendix O - Photo Documentation

The King Fire began on September 13th, 2014 on the Eldorado National Forest just north of the community of Pollock Pines. Extremely dry fuel conditions and low humidity contributed to rapid fire spread and the steep and rugged terrain limited firefighter access and contributed to dangerous conditions for firefighters. The King Fire burned out of control for almost three weeks eventually burning 97,717 acres, including 63,536 acres of National Forest System lands. At its height, over 8,000 personnel were assigned to the fire including182 hand crews, 558 engines, and 22 helicopters. *Photo S. Rael, September 17, 2015.*

At its height, as the King Fire threatened 12,000 residences, structure protection was a critical priority. Thousands were evacuated, many for several weeks. *Photo CALFIRE 9/14/14.*



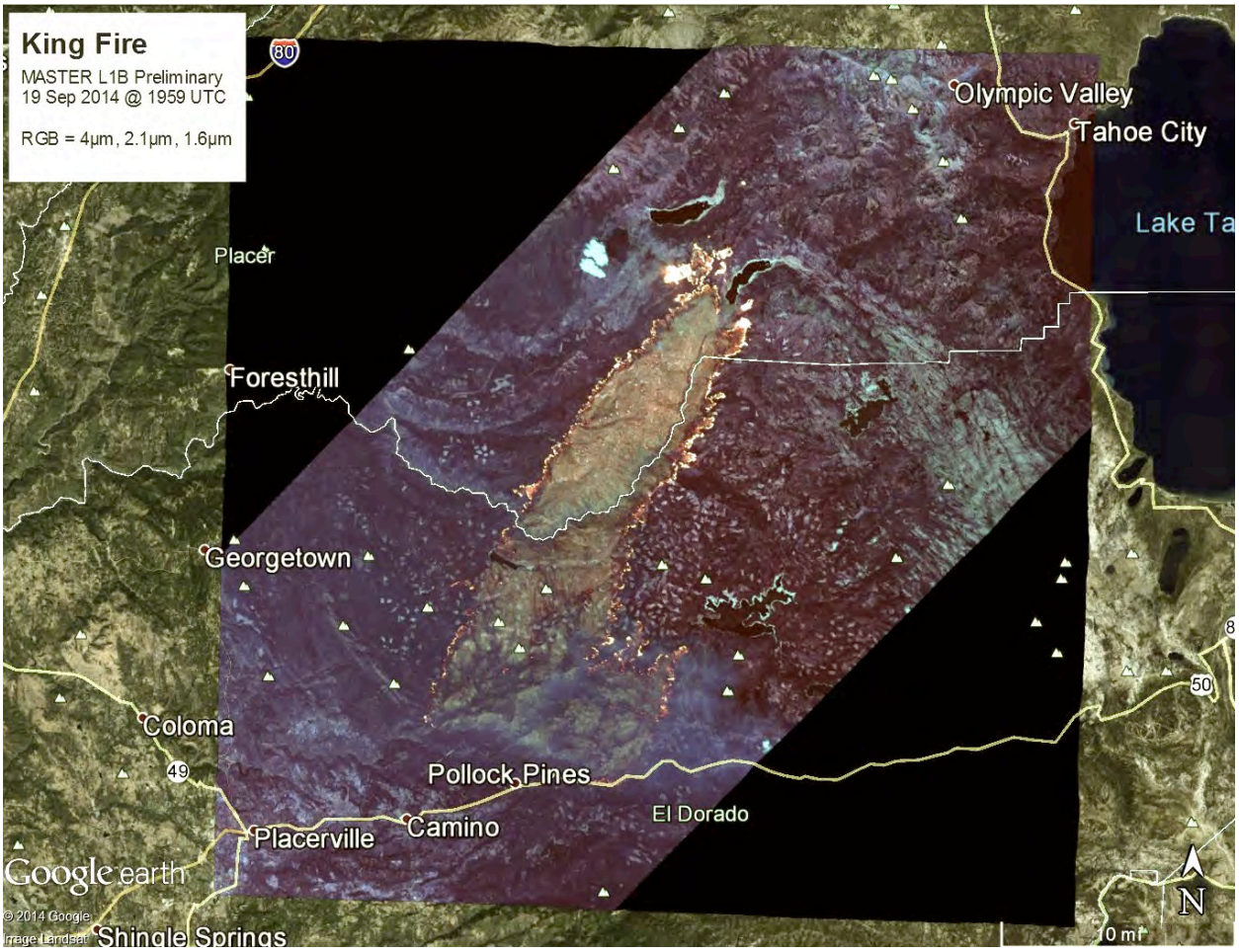
Smoke from the King Fire extended north and west into Oregon, Nevada and Idaho. Air quality reached unhealthy levels in mountain and foothill communities in Placer and El Dorado County, areas east of the Sierra Nevada crest including Truckee, Reno and Carson City. Smoke impacted an extensive region in northern California and western Nevada lasted multiple days. People were advised to avoid strenuous outdoor activity or to remain indoors because fine particles in smoke can irritate the eyes and respiratory system and aggravate chronic heart and lung disease. Smoke from the King fire pushed air pollution into the rarely seen “hazardous” category in many areas. “It is very unusual to see those numbers in the hazardous range,” stated Ann Hobbs, Placer County air-quality specialist. *Image NASA MODIS September 17, 2014*



Due to a variety of factors including drought stressed trees, very heavy fuel loading, and alignment with terrain, on September 17th the fire exhibited very extreme fire behavior and resulted in unprecedented growth. It expanded more than 50,000 acres in a matter of hours. Air attack described the fire as a 4 mile wall of flame. At about 2 to 3 pm, two spots were seen from air attack in the Rubicon River Canyon, a distance of 3 to 4 miles beyond the leading edge of the fire at the beginning of the day (as determined from the early morning infrared image). The winds may have exceeded an estimated 50 miles per hour.

View south across Stumpy Reservoir towards the vicinity of Lookout Mountain on September 17th at the beginning of the significant 50,000 acre growth northward within the Rubicon watershed. *Photo King Fire PIO Facebook 9/23/14.*

View south from Screwauger Ridge within the footprint of the 2013 American Fire into the column of the King Fire on September 17th. *King Fire PIO facebook page.*



The NASA image (MASTER, MODIS/ASTER Airborne Simulator) shows the extent of the intense combustion that occurred on the King Fire. These areas are shown in yellow. *Image NASA 9/19/14*.

A small strip of green vegetation near the Rubicon River is all that remains of the once-thriving mature forest habitat in this drainage. View northeast within the Rubicon watershed in the King Fire shows almost total consumption of vegetation in the watershed. *Photo USFS 10/5/14.*

This ‘jack strawed’ accumulation of fire killed trees is a result by fire-generated winds that occurred during the King Fire within the Rubicon Canyon. *Photo USFS 11/18/14.*

South of Wentworth Springs Road within an area of high fire severity. Manzanita brush and small hardwood trees in the understory have burned down to down to stobs. In the background, heavily scorched trees are seen. On the near left, dark brown needle remnants show evidence of “needle freeze”, with needles and branches curled up and over to the right. *Photo by Carlin Starrs, Blodgett Forest date unknown.*

Wildlife is often killed, injured or displaced within large wildfires such as the King Fire. In addition, their habitat is often destroyed or severally damaged. *Photos USFS King Fire Facebook September 2014 and El Dorado County Facebook Fall 2014.*

Pacific Gas and Electric workers repairing damaged power distribution lines within White Meadows area where many residences and associated structures were destroyed. Overall, the King Fire destroyed 12 residences and 68 other structures and damaged critical infrastructure including roads, bridges, transmission lines and hydro-electric facilities that resulted in millions of dollars in damages. *Photo USFS King Fire Facebook 9/23/14/*

Bedrock milling features within Native American archeological sites damaged by the King Fire. Note the fracturing, significant spalling of these granitic outcrops due to adjunct heavy fuel loading and downed logs which caused radiant heat for an extended duration. *Photo USFS 10/7/14 and 11/2014*

Confluence of the Middle Fork and the North Fork American River showing the significant sedimentation from the King Fire within the Middle Fork. This situation is expected to continue for several years. *Photo PCWA 2015.*

Debris flow drain into the Rubicon River adversely affecting downstream reservoirs and fisheries. This debris flow was a result of a moderate storm in April 2015. *Photo PCWA April 2015*.

Another debris flow into the Rubicon River April 2015. *Photo USFS 2015*.

Pidgeon's Roost Canyon high up in the watershed. A moderate spring storm caused plugged culverts as evidence by 10 feet of debris caught in a fire-killed tree. Burned slopes in the background illustrate the severe effects to the watershed. *Photo USFS 2015.*

Significant sedimentation directly deposited into a perennial stream as a result of a brief but intense storm in June 2015. *Photo USFS June 2015.*

Damage repair along Eleven Pines Road which is the primary access road within the Rubicon watershed. Significant fire related impacts to this road will continue to be problematic for several years. *Photo USFS King Fire Facebook 10/14/14.*

Both Forest Service System and county roads are located within the King Fire. The high number of fire-killed trees along these roads poses significant short-term and long-term hazards to both workers and the public. *Photos USFS 10/1/14 & K. Quidachay 2/28/15.*

Hazard trees and boulders on Eleven Pines Road. Due to the high fire severity within the King Fire, trees and rolling boulders will continue to pose significant hazards particularly in areas of steep slopes. *Photo USFS King Fire Facebook 10/01/14*

An example of the significant quantity of large, down woody debris that has occurred and will continue to occur over time at many locations within the King Fire in the absence of any salvage efforts or other fuels treatments. *Photo USFS 11/18/14.*

Vegetative recovery has been mixed within the fire, even within the same general location. These two photos were taken at different locations within the Nevada Point Ridge area. *Photo USFS 7/14/15*

An example within the 2004 Power Fire of the extremely high fuel loading situation that occurs over time in the absence of any salvage efforts or other fuels treatments as a shrub layer develops in the presence of a large accumulation of both standing and fallen, dead trees. Field conditions such as this prevent physical entry for virtually any sort of management and certainly pose a serious decades-long future risk of wildfires. *Photo USFS date unknown.*

Paired photos from a fixed point in an overlapping area of the 2000 Storrie Fire and the 2012 Chips Fire on the Plumas National Forest. This area was not salvaged after the Storrie Fire resulting in high snag densities and shrub growth and causing an elevated resistance to control, high-severity effects and high suppression costs during the Chips Fire. *Photo from USFS Fire Behavior Case Study 2012*.

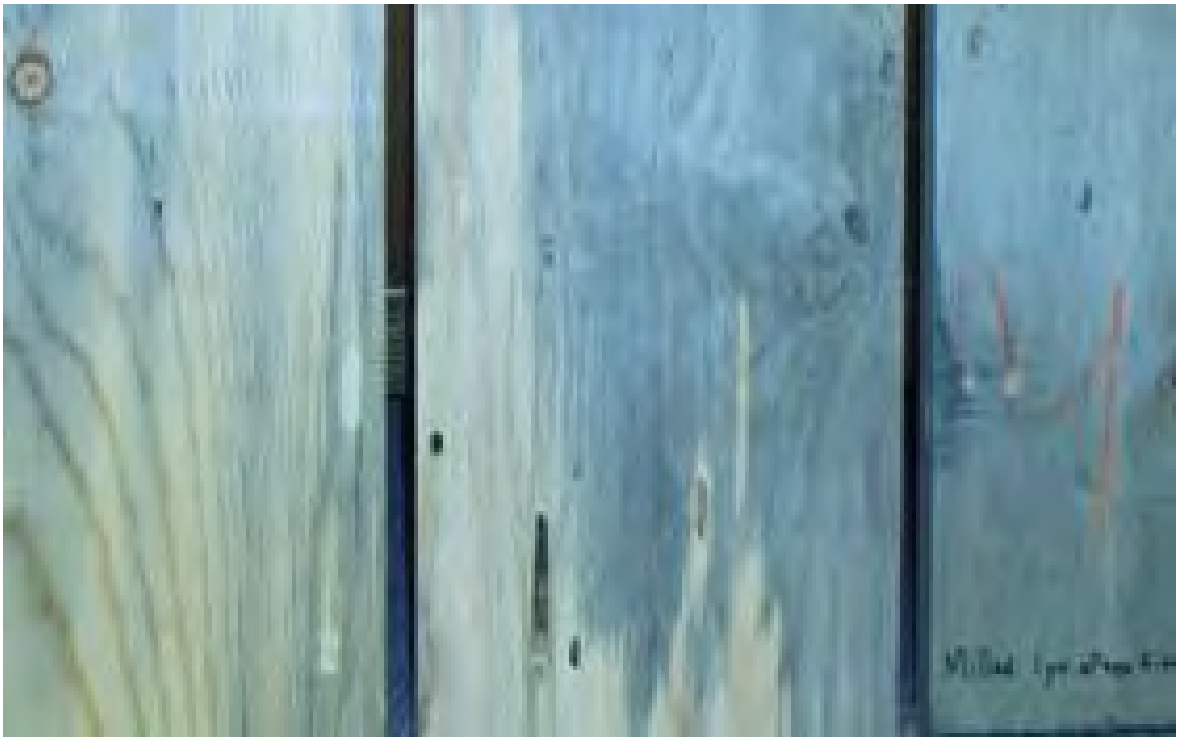
2005 field visit with Washoe tribal members at a large, complex Native American archaeological site located within the 2004 Power Fire Eldorado National Forest. In consultation with area tribes, helicopter logging was planned within this site in order to protect it from damage of fire killed tree fall and resultant future high severity fires. *Photo USFS 2005.*

Photo of the same archeological site in 2014. Due to a court injunction the planned logging was not conducted which has resulted in this current condition of high density snags, and heavy downed fire-killed tree on the ground under dense brush that is over ten feet high in places. Note: mid-photo several workers are located, the hard hats are visible. *Photo J. Peabody 6/28/14.*

Example of bedrock mortar outcrop at Native American archeological that is likely to be impacted by natural fire-killed tree fall in the absence of active conservation management such as directionally felling and removal. *Photo USFS November 2014.*

Native American archeological site within the King Fire showing displacement and exposure of ground-stone and lithic artifacts at a cultural resource site in the project area due to a tree that has uprooted. Pre-emptive hazard tree felling under the action alternatives can prevent or limit the adverse impacts due to large fire-killed and weakened tree fall and uprooting within similar such sites. *Photo USFS 2014*.

Photograph of high severity fire effects in a conifer stand in the northern portion of the King Fire on Nevada Point Ridge. Timber stands of similar structure are experiencing the slowest vegetative and soil recovery. *Photo USFS 2/27/15.*



Fire-killed trees rapidly deteriorate decreasing their economic value. Photos show this deterioration within both the logs and 'blue stained' milled wood one year after the 2001 Star Fire. *Photos USFS 2002*.

Example of Low Burn Severity within King Fire. Riparian vegetation has been minimally disturbed, groundcover is present, and green and brown pine needles remain on the trees. *Photo USFS Nov. 2014*

Example of Moderate Burn Severity within King Fire. Riparian vegetation has been consumed in some areas, but is present in other areas. Some pine needles have fallen to the ground and provided groundcover, while others remain on the trees. *Photo USFS November 2014.*

Example of High Burn Severity. All groundcover and riparian vegetation have been consumed and little to no pine needles remain on the trees. Instream large woody debris was partially or fully consumed throughout the channel. Note the sediment deposition within the stream channel as well as the large density of standing trees and potential for future high ground fuel accumulations. *Photo USFS November 2014.*

Un-salvaged areas within the 1992 Cleveland Fire showing significant natural fire-killed tree fall. These jack-strawed trees preclude natural reforestation and create impediments to fire-line construction during any future wildland fires. *Photo USFS data unknown.*

The 2009 Big Meadows Fire was an escape of a planned prescribed fire in Yosemite National Park. The photo shows the area that initially escaped, showing a large number of snags within a portion of the 1990 Arch Rock Fire. Large, downed fuel and snags present an increased resistance to control. When numerous standing snags exist, options to suppress the fire become limited. Firefighters may decide to relocate control lines away from the hazards, adding unburned fuel between firefighting resources and fuel, thus creating a new hazard. *Photo NPS 2009.*

Photo of the Buckskin Fire, shortly after the Siskiyou Rappel Crew arrived the day the fire was reported on June 11, 2015. Photo by Michael Bobic.

> *"A wildfire in southwest Oregon is bringing back memories of a huge fire that burned the same area 13 years ago. The Biscuit Fire burned half a million acres in 2002 leaving a forest of snags — dead trees that are now burning in a new fire, the Buckskin Fire…*
>
> *"..Firefighters are assessing the situation, contemplating strategies for the fire on steep slopes with an abundance of snags. Conventional direct tactics, constructing firelines on the edge of the burning area, may not be feasible because of the hazards of falling trees."*

(www.wildfiretoday.com/2015/06/13/buckskin-fire-burning-in-footprint-of-2002-biscuit-fire. Published at 12:59 p.m. PT, June 13, 2015).

Photo taken in 1997, five years after the 1992 Cleveland Fire in a 40-acre untreated natural recovery area. There were no surviving seed trees within one-quarter mile of this area, and no fuel treatments or reforestation efforts were taken after the fire to promote reforestation. At present it is largely unchanged and consists primarily of an impenetrable brush-field with essentially no conifer regeneration present. In the absence of seed trees, without active reforestation efforts, large areas on the King Fire will likely result in similar, though much larger fields of brush that will persist with little conifer regeneration for decades. *Photo USFS 1997.*

Photo shows the same natural recovery area in 2013, more than two decades after the Cleveland Fire. On the ridgeline on left side of the photo are 30 foot tall, planted trees. In time these planted trees may produce sufficient seed and when circumstances are favorable, some of these seeds or conifer seeds carried by animals or windborne from neighboring areas will eventually result in the re-establishment of a forested condition. *Photo USFS 2013*.

Plantation within the Windmilller Demonstration Plot established following the 1992 Cleveland Fire in consultation with area tribes. 16 years later, the treatment differences are noticeable; the area within the foreground was hand treated for competing vegetation and the area in the background was treated with herbicide. *Photo USFS 2008.*

Plantation established following the 1992 Cleveland Fire at 16 years old. Plantation was treated with herbicide for control of vegetative competition during establishment. *Photo USFS 2008*.

Photograph of approximately 50-year-old plantations established after the 1959 Ice House Fire and managed with herbicide, pre-commercial and commercial thinning. *Photo USFS date unknown.*

Area along the Chipmunk Creek drainage within the 2001 Star Fire on the Eldorado National Forest. Background reforested conditions in photo are similar to what is expected following salvage operations on the King Fire. The over-story trees that survived the fire serve as a seed source for natural regeneration. In addition to seed trees, some snags were retained, and outside of the creek buffer, herbicides were used to retard brush encroachment and promote conifer survival and growth. This treatment prescription is similar to what is proposed as part of the King Fire Restoration Project where surviving seed trees exist. *Photo USFS 2/27/15.*

Post-salvage natural regeneration within the 2001 Star Fire on the Eldorado National Forest. Note that fire-killed trees had been salvaged and the area has a reduced quantity of down fuel that promoted both a favorable seedbed for natural regeneration and facilitated good access for future management actions, such as seedling survival monitoring and pre-commercial thinning. *Photo USFS date unknown*.

2001 Star Fire five years post-salvage showing natural regeneration. Note the presence of numerous, adjacent seed trees and the relatively low quantity of ground fuel, which created a suitable seedbed for natural regeneration, a lower risk of an intense future wildfire, and promoting access for future management. *Photo USFS date unknown.*

Post-salvage restoration within the 2004 Power Fire on the Eldorado National Forest showing post-salvage natural regeneration. Note the background snags left in the drainage per the project Design Criteria. *Photo USFS date unknown*.

Before and After photos of the Clear Creek spotted owl nest site that was burned in the 2012 Chips Fire on the Plumas National Forest (before and after pictures). Prior to the Chips Fire this was an actively used nest tree where successful reproduction occurred. The nest site was abandoned after the fire. *Photo USFS, date unknown.*