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Sent via email to: comments-pacificsouthwest-eldorado@fs.fed.us

Re: Comment on Notice of Scoping of an Environmental Impact Statement (EIS) for the Proposed King Fire Restoration Project

Laurence Crabtree:

These comments are submitted on behalf of Sierra Forest Legacy, California Native Plant Society, the Sierra Club, and the Center for Sierra Nevada Conservation. We have reviewed the **Notice of Scoping for an Environmental Impact Statement (EIS) for the Proposed King Fire Restoration Project** documents. The purpose of these comments is to help inform, influence, and contribute to the development of a proposed action and alternatives to ensure that ecological integrity and ecosystem resiliency are provided throughout the restoration process. In the case of the King Fire, we have seven primary concerns: (1) an overriding purpose and need should be to develop and implement a rational landscape-wide long-term fuels management strategy; (2) effects of salvage activities to spotted owls should be avoided; (3) species diversity and abundance and fire resiliency in reforested areas should be maximized; (4) the ecological value of Complex Early Seral Forests (CESF) must be recognized; (5) the effects of herbicides on ecological integrity must be minimized avoided; (6) the adaptability of the post-fire landscape to climate change should be maximized; and (7) lava caps, sensitive and special interest plant species, and spread of noxious weeds should be avoided.

I. Establishing and Implementing a Landscape-wide Long-term Fuels Management Strategy

There is considerable scientific consensus that 100 years of fire suppression and 150 years logging practices that have focused on harvesting large fire-resilient conifers created conditions outside the Natural Range of Variability (NRV). When forest conditions outside NRV were combined with a three year drought and an arsonist's ignition on September 13, the results were high severity fire patch sizes and spread rates that even the most sophisticated fire models did not predict were possible. The King, Rim, Biscuit, Rodeo-Chediski, Wallow, and dozens of other so called mega fires 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. 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 failed to halt the King Fire yet the Forest Service seems set to replace the burned landscape with the same conditions 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 the purpose and need to use fire at the landscape scale to achieve appropriate ecological benefits.

Contrary to the idea purported in the scoping notice that there are numerous studies documenting the historical occurrence of frequent low severity fires in the mixed conifer forests of the Sierra Nevada, the scientific understanding of the natural fire/landscape dynamics has advanced and become more nuanced, with recent literature primarily supporting 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 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 suppression plays a key role in protecting communities, outside of the WUI suppression can be a barrier to implementing a large-scale fire and fuels management program. 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."

It is clear there is a need to increase the use of managing fire for resource benefits and 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 "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 burns is when fire burns into recent fire and eventually becomes self-regulating (Falk 2006; Stephenson 1999; Collins et al. 2009). While we understand there are numerous political constraints to implementing a landscape-wide prescribed fire program, the first step to overcoming these constraints is to plan as though they will be overcome and actively work to overcome them. 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 this, there is an immediate need to return fire to the system 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.

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. 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 a mixed severity disturbance regime 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; 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 25 years or more. Finally, 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 the EIS that allows for unplanned ignitions to be managed for resource benefit.

II. Minimizing the Effects of Salvage Activities to Spotted Owls

Conner et al. (2013), Tempel and Gutierrez (2013), and Tempel et al. (2014) suggest that spotted owls have declined on all Forest Service-managed lands in the Sierra Nevada, including a 50 percent decline from 1990 to 2012 within the project area (Tempel et al. 2014). Due to the low number of spotted owl territories affected by wildfire within the demographic study areas between 1990 and 2012, the observed declines are not correlated to the effects of wildfire. However, studies within the project area have correlated reductions in canopy cover from timber harvest and fuel treatments within increased breeding season dispersal (Seamans and Gutierrez 2007), reduced reproduction, reduced survival, reduced territory colonization, and increased territory extinction (Tempel et al. In Press).

There are relatively little data on the effects of high severity wildfire, in the absence of salvage logging, on spotted owls. Until recently (i.e., after the adoption of the 2004 Sierra Nevada Forest Plan Amendment), it was commonly assumed that the effects of high severity wildfire on spotted owls and other old forest species were synonymous with clear cut logging, primarily due to the effects of each on live canopy cover, to which occupancy and reproduction are often correlated. However, the structural complexity of Complex Early Seral Forests (CESF), compared to salvage or clear cut logged forests, is extremely high and spatially heterogeneous due to the presence of scattered pockets of surviving trees, substantial levels of native shrubs and sprouting hardwood trees, and high levels of woody legacies, such as snags and downed boles. These habitat elements play numerous roles in structuring and facilitating the development of the recovering ecosystem, providing habitat for survivors and colonists, moderating the physical environment, enriching aquatic systems in the disturbed area, and providing long-term sources of energy and nutrients. Due to the differences in structure and biotic diversity between CESF and a clear cut or salvage logged forest, it only makes sense that the response of old forest species to these disturbance events would also differ.

We acknowledge there is likely a threshold at which the amount of high severity burned forest within a spotted owl territory significantly increases the likelihood of abandonment and reduces the potential reproductive output. However, such a threshold has not been clearly established, yet evidence from Lee et al. (2012) indicates that it could be greater than 32 percent of a spotted owl territory. It is probable that whatever the effects of high severity fire are on spotted owls, salvage logging likely interacts with those effects to increase the probability of territory abandonment (Clark et al. 2013). Observations of spotted owl behavior in the Rim Fire (USDA Forest Service 2014) indicate that spotted owls returned to historic nest stands with very little green forest remaining. For example, a territory with less than 50 acres of green forest remaining and dominated by 90 to 100 percent reduction in live basal had a territorial single and nesting pairs return to historical activity centers through the nesting season (August 2014) that followed the Rim Fire (August 2013).

At this time, most lines of evidence suggest that spotted owls require high canopy cover forest stands or patches for nesting in burned (Bond 2009, Roberts et al. 2011) and unburned forests (Verner et al. 1992), but the effects of fire on foraging and territory stability are more nuanced and complicated. Studies by Bond et al. (2009) and Roberts et al. (2011), studies with little to no post-fire salvage logging, suggest that low and moderate severity burned forests continue to be used by spotted owls for foraging and such burn severities do not appear to affect occupancy as many as 14 years post-fire. Although the sample size was low, Bond et al. (2009) found that for five of the seven owls in the study modeling indicated the strongest selection for foraging was in high-severity burned forest within 1.5 kilometers of the territory center. Based on a personal communication with M. Bond (2014), the largest high severity patches used for foraging in Bond et al. (2009) were greater than 200 hectares (494 acres) in size, with some foraging points located near the center of the largest high-severity patches.

While it is true the results of Bond et al. (2009) are limited by a small sample size and a relatively short post-fire duration (four years) and there are no data to suggest how use changes as the structure of the CESF changes; there are also no empirical data to suggest that use declines. In contrast to the effects of wildfire on spotted owl occupancy, it is common knowledge that clear cut logging, which has an identical effect on forest structure as salvage logging, adversely affects spotted owl occupancy, habitat quality, and reproductive success. However, a primary difference between salvage logging and clear cut logging is that salvage logging interacts with the effects of wildfire. As such, one could 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 for clear cut logging.

In the Forest Service's opposition to a preliminary injunction on the Rim Fire Recovery Project, the Forest Service relied significantly on a recently published master's thesis, Eyes (2014), to suggest that the results of Bond et al. (2009) may not apply outside of the study area and there is evidence spotted owls avoid high severity burned area in some cases. However, there are significant issues with the study design of Eyes (2014) that we feel necessary to highlight, as these flaws call into question any inferences one can make about the use of high severity burned forest by spotted owls from that study. Eyes (2014) used radio telemetry to study foraging locations of 13 spotted owls with territories that overlapped burned areas in Yosemite National Park, using methods somewhat similar to Bond et al. (2009). Overall, the average area that was unburned or unchanged in all owl home ranges was 53 percent, while 25 percent burned at low, 16 percent at moderate, and 4 percent at high severity. The results show that the odds of non-use increased by 1.29 for each one unit increase in fire severity index, from which it was determined that spotted owls avoided high severity burn patches. However, there are three fundamental issues with the methods of Eyes (2014), first, unlike the methods of Bond et al. (2009), Eyes (2014) did not analyze habitat selection of each owl individually. Since each owl has different available habitat and most of the territories had insignificant amounts of high severity fire (see Figure 2 in Eyes (2014)), the results could have been confounded by a single individual with a significant amount of high severity fire that avoided it for some reason. Second, in one of the only territories with high severity fire in it, Eyes (2014) analyzed the effects of a fire that occurred in 2009 (see Figure 3 in Eyes (2014)); however, the area in question also burned in 1990 (see Figure 2 in van Wagtendonk and Lutz 2007); and it appears there are a number of foraging locations that overlap with areas that burned at high severity in 1990 but did not burn at high severity in 2009. Finally, Eyes (2014) created a single fire severity index for the area within each buffered foraging location, which effectively skews the results toward a low to moderate fire severity index. Eyes (2014) assigned a number from 2 to 5 to represent the four fire severity classes, with 2 being unchanged and 5 being high severity. The proportion of each buffered foraging location burning at each severity class was multiplied by the assigned severity number, the results were then summed to provide a single fire severity index number for each buffered foraging location. For example, if a buffered foraging location burned at 50 percent high severity and 50 unchanged, the foraging location would receive a fire severity index score of 3.5 ($0.5 \times 5 + 0.5 \times 2$), suggesting the owl was foraging in a low to moderate severity burn patch, when in reality, the owl was either foraging in a high severity burn patch or a unburned patch. If you intend to use Eyes (2014) to support spotted owl avoidance of habitat that burned with high severity, we ask that you address the issues noted above.

Due to the significant declines throughout the species' range and within the project area and the fact that the only variable one has control over in trying to minimize the compounding effects of fire and salvage logging on spotted owls is salvage logging, we ask that the Forest Service avoid all salvage logging within 0.7 mile radius (half the mean nearest neighbor distance on the Eldorado National Forest, Seamans and Gutierrez 2007) surrounding all occupied spotted owl territory centers. We also ask that spotted owl protocol surveys be conducted within 0.7 mile of all salvage activities. We are aware that the U.S. Fish and Wildlife Service (FWS) recently received a petition to list the California spotted owl under the U.S. Endangered Species Act. We suggest the Forest Service review the justifications outlined by the FWS in the 2006 spotted owl not warranted determination, it appears that the foundations of the 2006 not warranted determination have been proven false by a substantial body of scientific literature published over the past eight years. The Forest Service should not continue to ignore the best available science as it pertains to the species and must begin to make management decisions that reverse the range-wide population declines observed over the past several decades. Because there is substantial evidence that spotted owls are adapted to mixed severity fire, we reiterate the need to begin implementing a landscape-wide long-term fuels management strategy that provides for the necessary disturbance processes that can enhance habitat conditions and increase resilience across the landscape.

III. Maximizing Species Abundance and Diversity and the Resiliency of Reforested Areas

We congratulate the Forest Service for considering reforestation methods and ideas that incorporate concepts of heterogeneity, something that has not be attempted on a large scale in the Sierra Nevada. Because the specifics of the reforestation methods remain unclear, we offer the following suggestions. We ask that native plant and animal species diversity and abundance be maximized within stands and across the landscape by avoiding the use of herbicides whenever possible. This idea is supported in the Forest Service Region 5 Ecological Restoration Leadership Intent which states, "Ensure vegetation and fire management efforts are ground in concern for biodiversity and ecological process both before and after disturbances like fire." We ask that the Forest Service have patience in returning the area to a mature forest condition and that individual tree health and tree vigor not be confused with ecosystem health. Shatford et al. (2007) found there was no evidence of recent conifer mortality or suppression leading to death of naturally regenerating conifer seedlings that were overtopped by shrubs and hardwoods, and it was quite likely that height growth of shrubs had slowed after 9 to 19 years (Brown and Smith 2000) while tree height growth continued to slowly increase and conifer mortality would remain low and tree height growth would accelerate as individuals continued to emerge above the shrub layer (Conard and Radosevich 1982).

We believe that reforested areas should be resilient to fire at all stages of development and that returning fire to the system early in stand development is the most ecologically appropriate means to develop and maintain fire resilient stand structures and begin to create landscape heterogeneity within large high severity burn patches; therefore, we ask that the Forest Service locate and design reforestation units that facilitate efficient use of low intensity backing fires (e.g., long units that run parallel to slope) and that the fuel conditions that suggest prescribed fire should be used in reforestation units be defined, and if appropriate, include the use of prescribed fire within reforested areas as part of the King Fire Restoration Project EIS. Because seedling survival can be near 100 percent when conditions are favorable, we ask that planting densities be at or near desired conditions to minimize the potential use of herbicides associated with site preparation or release, minimize the need to conduct a pre-commercial thin, and maximize growing space for non-conifer native grasses, forbs, and shrubs.

A March, 2005 report to Congress from the General Accounting Office (GAO) found large data reporting inaccuracy prevalent in the way the FS determines reforestation needs. The report also found that:

> "In some places, regional culture that reflects a former management emphasis and budgetary situation influences current practices. For example, when reforesting an area, **officials in the Pacific Southwest region almost always rely on planting—a more expensive method than natural regeneration—because they have always done so** and, according to agency officials, this practice has been reinforced by the regional culture. When the agency-wide management emphasis was timber production, reforestation standards called for prompt reforestation and tightly spaced trees to maximize timber volume; so officials rarely relied on natural regeneration, which does not necessarily ensure rapid reforestation or result in tightly spaced trees. In addition, when timber revenues were higher and reforestation efforts centered on harvested areas, the region could always afford to plant. Now, as the agency's management emphasis has shifted to ecosystem and forest health, and as budgets have become increasingly strained, officials in the Pacific Southwest region said they are beginning to encourage greater reliance on natural regeneration, but it remains to be seen whether forests and districts will adjust their practices, accordingly."

The GAO made specific recommendations to the Forest Service that were agreed upon by Chief Dale Bosworth in his response to the GAO report. These included a recommendation to establish criteria for prioritizing the use of reforestation funds:

> "The shift in management emphasis from timber production to ecosystem management, combined with constrained budgets and changing sources of reforestation needs, has changed the context in which the reforestation and timber stand improvement program operates. However, the Forest Service has not

updated its goals and policies for the program to reflect this change. Until the agency does so, it will be difficult to establish criteria for prioritizing the use of reforestation and timber stand improvement funds. In the current budget environment, such criteria are crucial for identifying the best investments to minimize possible adverse effects so that the Forest Service can fulfill its stewardship responsibility and ensure the lasting health and productivity of our national forests" (GAO 2005).

Natural regeneration is generally prolific after fires in the Sierra Nevada, although it is hindered by salvage operations (Donato et al. 2006). In a recent study of regeneration in the Fred's Fire, also on the Eldorado National Forest, areas that had not been planted showed "prolific" regeneration in the majority of plots, and even in those which burned with high severity occurred at seedling densities of 872 seedlings/acre in severity 4 and 224 seedlings/acre in severity 5 (Bohlman 2012). Seedlings were 97 percent conifers. The need for action on the King Fire should be judged in conjunction with the results of the Bohlman (2012) assessment of the unplanted plots in this recent Fred's fire on the Eldorado NF.

IV. Recognizing the Ecological Value of Complex Early Seral Forests

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 (Noss et al 2006, Lindenmayer and Franklin 2002). 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 (DellaSala et al. 2014). 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. 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).

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.

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).

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.

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 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:

> "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).

"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).

"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).

"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). "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."

"Traditional intensive forest management encouraging prompt reforestation and few legacies is unlikely to approximate the role of naturally generated early-seral conditions" (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.

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.

V. Effects of Herbicides on Ecological Integrity and the Environment

The agency proposes the use of the herbicide glyphosate to kill understory vegetation on approximately 13,940 acres that will be planted with conifer pine seedlings. The EIS must assess direct, indirect, and cumulative effects to sensitive species (both plants and animals), management indicator species, and early successional forest ecosystems from this proposed activity. We are not only requesting information about the impacts from toxic chemicals, but we are also asking for an analysis of the ecological impacts resulting from intentionally destroying wildlife and pollinator habitat, and native plant communities. This is a long term impact for two reasons. First, these habitats are sensitive, and have been highly disturbed from the fire and suppression activities. Salvage logging and planting will interrupt recovery, and will adversely impact the structure (snags, down wood) and species composition (conifers favored over native early forest species such as Ceanothus, chinquapin, tan oak, manzanita, and numerous fire-following native grasses and forbs which form the foundation of the forest food web) of the post-fire habitat, thereby impacting the many species which require complex early seral forest. Secondly, habitat will be further altered when herbicides are used to kill the native vegetation community that supplies food and habitat for the entire food web in young forests. This future successional stages and the next time the forest is returned to an early seral condition by wildfire, perpetuating a lack of key legacy structure and components into the future.

The traditional silvicultural models in use on the Eldorado NF to maximize growth of crop trees have resulted in a shortened interval between planting and canopy closure and thus have reduced the time interval for establishment of early-successional plant species. Additionally, "increased competition control [herbicides] may result in reduced seed rain of early- successional species, thereby impacting potential plant community responses following subsequent disturbances" (Miller and Miller 2004). This is a significant cumulative impact that must be mitigated under the requirements of NEPA.

Herbicides are applied in quantities and at repeated intervals that effectively eliminate the early successional phase of forest development. Glyphosate is usually applied in the spring when vegetation is growing rapidly, and when many birds, amphibians, mammals, and invertebrates are actively reproducing and rearing young. Since this chemical in its various formulations has been implicated as an endocrine disruptor or hormone mimic (see references below), wildlife will be exposed to chemicals that can interfere with normal reproduction and development. The additional use of this chemical and other herbicides by industrial timber owner Sierra Pacific Industries within the range of wildlife in the King Fire area is a significant cumulative impact that cannot be mitigated, since wildlife cannot be restrained from moving through areas where the chemicals are applied. The loss of early successional understory species due to industrial forest management practices is devastating for wildlife, and underscores the necessity of preserving the wildlife resource value of the public lands portion of the King Fire by maintaining all early successional, post-fire native vegetation to the maximum amount possible. The use of herbicides to kill this native component is not congruent with ecological integrity or any other conservation objective and should be rejected by the Eldorado National Forest decision team.

A. Minimize or Avoid Affects to Sensitive and Special Status Species from Herbicides

Under the ESA, NFMA, NEPA, and the forest plan, the Forest Service is required to analyze potential effects to threatened, endangered, and sensitive species as well as to management indicator species (MIS). The EIS must disclose the impacts of the proposal on habitat and populations. The Forest Service Handbook defines the preferred alternative as "the alternative that causes the least damage to the biological and physical environment and best protects, preserves, and enhances historical, cultural, and natural resources" (FSH, Zero Code—05 – Definitions). The use of agricultural chemicals to kill native vegetation that has been identified as the rarest type of forest type today, e.g., the complex early successional forest ecosystem (Swanson et al 2011, 2014; DellaSala et al 2013) is not congruent with FSH, current regional and national policy, and the new planning rule.

For Management Indicator Species (MIS), the MIS amendment for the Sierra Nevada forests requires an analysis of the status and impacts of the following species: Nashville warbler, warbling vireo, yellow warbler, fox sparrow, golden-mantled ground squirrel, hairy woodpecker, and black-backed woodpecker. A complete analysis of potential effects to these species should be based on species surveys, population data and trends, and viability analysis. Explicit monitoring and mitigation records and plans should be displayed.

The effects of herbicides used in the context of forestry on amphibians at all stages of development must be evaluated and section 7 consultation with the U.S. Fish and Wildlife Service is required for potential adverse effects to California red-legged and Sierra Nevada yellow-legged frogs. The U.S. Fish and Wildlife Service (FWS) examined the use of the herbicide Round-Up in its recovery plan for the threatened California red-legged frog. The surfactant in Round-up was determined to have "severe negative effects on amphibians (USFWS

2002). All herbicides are considered to have a negative impact on amphibians due to destruction of plant cover. The EIS should review the records for California red-legged and foothill and Sierra Nevada yellow-legged frogs to determine if the project will impact these species. Both glyphosate and triclopyr are listed among the 25 "chemicals of greatest concern" for the survival of red-legged frogs, fish, and their habitats (FWS 2002). Analysis of the effects of the proposed action on wildlife must also address the endocrine disrupting effects of the proposed herbicides, surfactants and inert additives.

Analysis must include the full range of effects to individuals, populations, and to habitat that may result from herbicide use at this scale. Planning alternatives should be defined and evaluated in terms of both amount and quality of habitat, and of population trends of sensitive and special status species, impacts on deer and other wildlife, and the cumulative impact of the project when considered in aggregate with the number of acres of native forest that have already been converted to plantations both on public and adjacent private industrial timber lands. This is a key requirement to assess the potential cumulative impacts of the proposed action.

The EIS should also address effects to non-target species, including pollinators such as Western bumble bee, a Region 5 and ENF sensitive species, and other native solitary bees, moths, and butterflies. Herbicides affect these species directly through contact and also by destruction of the plants necessary for species' survival. Researchers have found that some pollinators will not cross over fragmented habitats in search of nectar sources (Kearns et al 1998). A literature review of plant-pollinator interactions found that widespread use of herbicides were even more detrimental to pollinating insects than insecticides (ibid). Pesticides, including herbicides, have been identified as one of the main causes of bee extinctions nationally (Xerces Society).

Many butterflies and moths are dependent on a single or a very limited number of larval host plants. Asclepias (milkweed) and Apocynum sp. (dogbane) are both important plants for a variety of insect species, including the monarch butterfly. Several native moths use Ceanothus exclusively as larval host plants. Rare Clarkia species are pollinated by specialist Clarkia bees, which nest in the ground close to the Clarkia populations. A rare moth, the Green Sphinx moth, requires Clarkia for its larval stage, and pupates in the ground near Clarkia. In terms of biodiversity, it cannot be overstated that allowing natural regeneration to occur throughout most of the burned areas is the most scientifically defensible strategy to help maintain thriving populations of these and many other species that are threatened with loss of habitat from both fire suppression and post-fire management activities—including herbicide use.

B. Impacts to Sensitive Plants

The Sierra Nevada Forest Plan Amendment directs the agency to minimize or eliminate direct and indirect impacts from management activities on threatened, endangered, proposed and sensitive plants ("TEPS") unless the activity is designed to maintain or improve plant populations (SNFPA Standards & Guidelines, Vol. 1, p. 366). This standard was affirmed on November 18, 2004 by the Chief of the Forest Service during his review of the SNFPA appeals decision made by the Regional Forester. Since many TEPS plants are dependent on fire for their long term viability, any actions that destroy potential TEPS habitat in the post-fire environment, or that will result in permanent elimination of post-fire habitat (such as reforestation), would not be in compliance with this direction. The post-fire habitat must be evaluated with the assumption that new TEPS plants not previously known to occur in the area have now made their appearance. Long dormant seeds could easily be triggered to germinate after the fire.

Fire suppression has contributed to widespread loss of species that cannot survive without fire, but they also cannot survive in uniform, densely planted tree plantations. Floristic surveys must be conducted--in other words, all species seen should be identified,and these must be reported in the documentation of the survey. This is the only means to ensure that new populations of TE&S species, stimulated by the return of fire, will not be missed. Surveying should take place in the spring and summer prior to salvage logging, reforestation, or herbicide use. The ENF is required to design the proposal to maintain or improve sensitive plant habitat and known populations for long-term viability as required by the forest plan.

C. Invasive Grass Expansion Associated with Herbicide Use

Herbicides are known to increase the prevalence of flammable grasses (Rinella et al 2009, McGinnis et al 2010). McGinnis et al. 2010 suggest that herbicide-treated areas may be in danger of recurrent grass fires, especially in areas with frequent anthropogenic ignitions, because alien grasses and forbs are stimulated to grow when shrubs are killed; creating highly flammable fuel beds that may burn more frequently, though less intensely, than the native vegetation. Reburning herbicide-treated areas also increases grasses and forbs; therefore, subsequent fires may increase the probability of a reburn intense enough to kill young conifers. In addition, herbicide-treated areas have more alien grass and forb species than areas with high shrub cover" (McGinnis et al 2010).

Use of herbicides in the King Fire area will likely result in an explosion of non-native invasive grasses, which already occur in the area. The result will be a flammable configuration of small, densely growing plantation pines in a sea of invasive grass, as is the case in the plantations installed after the Cleveland Fire (see photo below, Cleveland Fire reforestation, 2006). This produces the opposite affect that the proposed action claims to be hoping to achieve, i.e., increased fire resiliency.

D. Use of the Best Available Science on the Effects of Herbicides

In order to meet the requirement of using the best available science, the EIS must disclose the potentially significant effects of the chemicals proposed for use as they are actually applied in the field. In other words, not as individual chemicals such as glyphosate, but as mixtures with surfactants and other adjuvants. The effects must include analysis of impacts from endocrine disruption and reproductive toxicity, both for human health and for wildlife.

Since 1990, numerous researchers have documented that certain chemicals act as endocrine disruptors or hormone mimics. The hormonal effects of many common chemicals, even those with little or no hormonal activity, increased exponentially when combined with other chemicals. Some inert ingredients are known to be extremely active biologically and several are powerful endocrine disruptors (Porter et al 1999). Hormone mimicking chemicals are now known to be responsible for many reproductive disorders in the environment. Pulse doses of even low levels of pesticides at critical times when developmental windows are open can lead to permanent changes in the embryo or fetus (Ibid). The herbicide risk assessments used by the Forest Service, the SERA reports, and the 1989 Regional Vegetation Management EIS do not provide sufficient information on mixtures regarding potential effects of the chemicals proposed for use in the King Fire area, including hormone mimicking chemicals, to allow the Forest Service to make an informed decision regarding possible effects, including direct and synergistic effects on reproduction. New information regarding these and other synergistic effects indicates that potential impacts on wildlife must be gathered and assessed. A new Vegetation Management region-wide EIS is necessary to do the level of assessment to bring the agency up to speed with the most current and relevant science.

- Analyze the environmental impacts of the chemicals as they are actually applied in the field, as a formulation or mixture
- Disclose the environmental impacts of the degradates and secondary metabolites of the chemicals
- Include data for endocrine disruption at environmentally relevant (in other words, dilute) exposures as a toxicological endpoint
- Analyze the ecological effects to ecosystems from use of herbicides to manipulate vegetation. Ecological references should be supported by citation and footnote. The analysis must not be limited to toxicological effects analysis.
- Document the monitoring protocols and criteria, and data proof that herbicides are necessary to achieve the desired goals for project area.

The environmental effects must be disclosed 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 EIS must be able to analyze the impacts of the herbicide products as they will actually be used.

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”— in other words, at dilute concentrations easily encountered by the organism in the field where run off 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, but did not significantly affect spring peeper and American toad tadpoles.

Glyphosate products were also 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 Roundup—and not just glyphosate—were compiled by the New York State Consumer Fraud division of the Attorney General's office (Attorney General of New York 1996), resulting in fines both in New York State (false advertising concerning Roundup's safety) and France (2007).

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 such as POEA in Roundup may be the principal toxic component in the formulated glyphosate products to aquatic organism (Tsui and Chu, 2003). In a review of toxicological data, Giesy et al. (2000) found POEA to be more toxic to fish than glyphosate.

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. The direct G 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). The role of surfactants to allow G to permeate through animal cell membranes 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.

Finally in regard to the FS SERA analyses of impacts from forestry herbicides in general, and for these chemicals in particular, we caution that the GLEAMS model for predicting water contamination rates may not be sufficiently precise to qualify as relevant to the King Fire area (SERA 2001). The model was created for agricultural lands that are basically flat. Run-off is likely to be significantly greater in the King Fire area, and impacts from run-off to non-target plants and animals is likely to be underestimated using the GLEAMS model.

VI. Climate Change

> *"We will increase our focus on restoration of our forest and grassland ecosystems; restoration to increase resilience to ensure these systems are able to adapt to changes in climate."*
>
> ~ Forest Service Chief Tom Tidwell

In the Sierra Nevada, resilience to climate change is best arrived at by allowing fire to regulate structure and succession (Hurteau and North 2010). Naturally regenerated CESFs are likely to be better adapted to the present-day climate and may be more adaptable to future climate change (Swanson et al 2011). The relationship between climate change and forests was explored in detail in a 2008 report from the Secretariat of the Convention on Biodiversity, where the Forest Service was a co-author. These are some of the key findings of the report that relate to the King Fire:

> "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."
>
> "Forest biological diversity results from evolutionary processes over thousands and even millions of years which, in themselves, are driven by ecological forces such as climate, fire, competition and disturbance. Furthermore, the diversity of forest ecosystems (in both physical and biological features) results in high levels of adaptation, a feature of forest ecosystems which is an integral component of their biological diversity. Within specific forest ecosystems, the maintenance of ecological processes is dependent upon the maintenance of their biological diversity."
>
> "Plantations and modified natural forests will face greater disturbances and risks for large-scale losses due to climate change than primary forests, because of their generally reduced biodiversity."

Recommendations from the report:

- Maintain stand and landscape structural complexity, using natural forests and processes as models.
- Maintain biodiversity at all scales (stand, landscape, bioregional) and of all elements (genes, species, communities) by, for example, protecting tree populations which are isolated, disjunct, or at margins of their distributions, source habitats, and refuge networks. These populations are most likely to represent pre-adapted gene pools for responding to climate change and could form core populations as conditions change (excerpted from Thompson et al 2008).

VII. Plant Resources: Lava Caps and Invasive Weeds.

A. Lava Caps

According to the map presented at the King Fire Workshop, the project proposes to remove hazard trees on all the roads on Peavine Ridge of the Pacific Ranger District and many of these roads pass through lava caps. Lava caps are presently protected as Special Interest plant communities because they provide important pockets of biodiversity. These stony forest openings occur on Ledmount series soils, support unique plant communities, and provide habitat for two sensitive plant species, Pleasant Valley mariposa lily (*Calochortus clavatus*) and yellow bur navarretia (*Navarretia prolifera*), and two special interest plant species, Mewuk manzanita (*Arctostaphylos mewukka*) and Pratten's buckwheat (*Eriogonum prattenianum*).

In 2012, members of the El Dorado Chapter of the California Native Plant Society (CNPS) established twenty-two scientific study plots on lava caps throughout the Eldorado National Forest. The lava cap plot study design was guided and advised by Jim Alford, a graduate student at CSU Sacramento, and his mentor Todd Keeler-Wolfe, author of the Manual of California Vegetation. Plots were established, read, duly recorded, and results analyzed.

The King Fire burned through six of the twenty-two plots. CNPS has received informal permission to return in the spring of 2015 to re-evaluate and survey those six plots. Lava caps are extremely fragile and subject to erosion and compaction when disturbed. Lava caps are often termed 'low site' because of the shallow soils; as such we expect there to be very few hazard trees associated with lava caps. However, lava cap habitats are sometimes thought to be "barren" areas. Due to this categorization, they might mistakenly be used as landings, vehicle or equipment storage, or for other restoration-related activities that are incompatible with maintaining the health and integrity of these sensitive botanical areas. Therefore, we ask that all lava caps and the CNPS lava cap plots be flagged and protected from disturbance during any and all King Fire Restoration activities. General waypoints and maps for the six plots can be submitted upon request.

A partial list of road numbers of concern are: Peavine Ridge Road (35 or 11N63); Old County Road (11N55.2 and 11N55.3); side road (11N70C); Ridge Road (11N56A and 11N56); Jay Bird Canyon (11N56 to 11N73); Road 11N59; Spur Road 11N55D; Telephone Ridge Road (11N70); Road 11N64H; Road 11N73 and others.

We also ask that a more comprehensive approach be taken to identify the sensitive lava cap areas within which ground disturbing activities should be avoided. We ask that remote sensing be used to more completely identify the extent and distribution of the sensitive lava caps areas. In addition to its use in planning actions in response to the King Fire, this more comprehensive assessment could be incorporated into the Wildland Fire Decision Support System (WFDSS) to provide information to resource managers on the location of resources that would be sensitive to ground disturbance during future fire management operations. This comprehensive delineation could also be used to support plans to restore these habitats by removing berms, managing annual weedy grasses, and generally protecting lava cap areas from roads, road building, road decommissioning, tree harvest, and vehicles.

B. Invasive Weeds

Due to the explosive nature of the King Fire, we understand the truck washing station was not in place and functioning from the very beginning of the King Fire. Vehicles are a fine vector of weed seeds clinging to wheels or running gear.

The Eldorado has a good handle on the existing noxious or exotic weeds found on Forest. However, we are particularly concerned about a new weed threat in the form of *Dittrichia graveolens*, or stinkwort. So far it is somewhat under the radar, as it has escaped being listed by the U.S. Department of Agriculture as an A list weed. It has spread explosively in the State and has occupied many acres of developed lands. Two years ago, this species was not found east of Highway 49. Since then, it has advanced upon El Dorado County and up Highway 50 to the east of Camino. At this time, CalFlora (http://www.calflora.org/) shows its elevational range limit is 3,200 feet. There are roadside occurrences of this weed near the Forest Supervisor's Office, at the intersection of Forni Road and Highway 50 in Placerville near Office Max, which is in close proximity to the location of the King Fire Incident Command Center at the Eldorado County Fairgrounds. One can expect that it will shortly be in the Forest Service parking lot, from which it might be transported into lands within the national forest.

We understand that noxious weed treatments, prevention and mitigation will be included in the proposed action. However, we feel that stinkwort is a very volatile and important weed that has not received enough attention. As far as we know, it has not appeared on the Forest, but the risk of spread should be addressed in the EIS.

Thank you for your time and attention. Please direct any questions or comments to Ben Solvesky (ben@sierraforestlegacy.org; 928-221-6102).

Sincerely,

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