

I, JONATHAN J. RHODES, declare and state as follows:

Qualifications

1. My name is Jonathan J. Rhodes. I am a hydrologist with more than 28 years of professional experience. I have a B.S. in hydrology from University of Arizona, an M.S. in hydrology and hydrogeology from University of Nevada-Reno and I finished all required academic work toward a Ph.D. in forest hydrology at the University of Washington. My professional experience includes work with tribal, federal, state, county, and city governments, universities, and non-profit groups in eight western states, including more than 12.5 years at the Columbia River Inter-Tribal Fish Commission (CRITFC), where I served as Senior Scientist-Hydrologist and my primary focus was the protection of salmon and steelhead habitats on public lands in Columbia River basin.

2. I am co-author of three pioneering scientific works on the effects of fire on watershed systems and postfire ecosystem management. These are: Wildfire and Salvage Logging, Recommendations for Ecologically Sound Post-Fire Salvage Management and Other Post-Fire Treatments, a consensus report developed with seven other scientists (Beschta et al., 1995); Postfire Management on Forested Public Lands of the Western USA (Beschta et al., 2004), published in the scholarly journal Conservation Biology; and, Postfire Salvage Logging's Effects on Aquatic Ecosystems in the American West (Karr et al., 2004), published in the scholarly journal, BioScience.

3. I am also the lead author of the first peer-reviewed paper to estimate the likelihood that fuel treatments can affect fire behavior on public lands in the Western U.S., based on data from more than 40,000 fires that burned from 1980-2004, Fire Probability, Fuel Treatment Effectiveness and Ecological Tradeoffs in Western U.S. Public Forests (Rhodes and Baker, 2008), published in the scholarly journal, Open Forest Science Journal. This paper also provides a straightforward method for estimating the probability of fire occurrence in order to examine the likelihood that areas treated to alter forest fuel conditions can affect fire behavior.

4. I am the primary author of a peer-reviewed paper examining the impacts of fine sediment levels on salmon survival in streams in the Blue Mountains of Oregon (Rhodes and

Purser, 1998) and “A Coarse Screening Process for Potential Application in ESA Consultations” (Rhodes et al., 1994), a peer-reviewed report developed under contract at the behest of NOAA Fisheries. The latter included an extensive review of available scientific information on the effects of roads, logging, and grazing on anadromous fish habitats and survival, including that from Umatilla National Forest and other national forests in the Blue Mountains of Oregon. I am also an author of “The Failure of Existing Plans to Protect Salmon Habitat on the Clearwater National Forest in Idaho” (Espinosa et al., 1997), a data-driven retrospective evaluation of the effects of forest plan implementation on salmon habitats on the Clearwater National Forest, published in the scholarly journal, *Journal of Environmental Management*. I am also an author of a multi-year study that examined the impacts of sediment delivery and fine sediments on salmon survival in the Stillaguamish River, Washington (Purser et al., 2009).

5. I have served as a peer-reviewer for scholarly journals, including the *North American Journal of Fisheries* for papers related to postfire soil erosion and stream sedimentation and the *Open Forest Science Journal* for papers related to the effects of forest conditions on fire severity. I have also served as a peer-reviewer for the proceedings of an international conference for papers related to soil erosion and stream sedimentation from forestry activities.

6. For more than 20 years, a major focus of my work has been the evaluation of the effects of fire, livestock grazing, logging activities, including roads and landings, on soils, watershed processes, and resulting effects on aquatic resources. I did this on the Umatilla National Forest (UNF) on a regular basis for more than 12 years. I have evaluated and documented the effects of fire, roads, grazing, and logging activities on at least 19 national forests in seven Western states.

7. During my tenure at CRITFC, our work with the U.S. Forest Service (USFS) provided the groundwork for most of the substantive watershed protection measures ultimately adopted—albeit in a diluted form—by the USFS and U.S. Bureau of Land Management (BLM) in two combined agency management strategies designed to limit damage to habitats for anadromous and resident salmonids: “Implementation of Interim Strategies for Managing

Anadromous Fish Producing Watersheds in Eastern Oregon and Washington, Idaho, and portions of California” (“PACFISH”) and “Inland Native Strategies for Managing Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, Western Montana, and Portions of Nevada” (“INFISH”).

8. I am quite familiar with the Desolation Creek watershed project area, including its ecosystem attributes, streams, and fish populations. I have performed numerous field inspections of this watershed on a routine basis from 1989 to 2001. Some of the results of this monitoring were included in a video (Rhodes et al., 1993) that chronicled damage to fish habitats and was presented at the 1993 national meeting of the American Fisheries Society. I am quite familiar with the effects of the “Summit Fire” that affected parts of the Desolation Creek watershed. I spent hundreds of hours monitoring and examining the effects of the fire as well as the impacts of postfire logging of the fire-affected area. Part of my monitoring of these impacts was published in the scholarly journal, *BioScience* (Karr et al., 2004).

9. I have served as principal investigator for several extensive and intensive federally-funded studies on the effects of logging, roads, and grazing on soil conditions, soil erosion, and resulting aquatic impacts. A true and correct copy of my curriculum vitae is attached to this declaration.

Information Reviewed:

10. I reviewed the FEIS for the "Farley Vegetation Management Project" (hereinafter: "Project") on the North Fork John Day Ranger District (NFJDRD) of the UNF, dated June 2009. I also reviewed pertinent technical literature, which I have listed at the end of my declaration, following my signature page. I also drew on my professional judgment and experience, including that within the project area and forested ecosystems on public lands throughout eastern Oregon and Washington over the past 20 years.

Scope of Review:

11. I submit this declaration to explain how the proposed logging and related activities under the Project’s action alternatives, including the selected Alt. 2, will significantly damage a variety of ecosystem resources, including soils, streams, aquatic habitats, and water

quality in an enduring manner, that is far from adequately divulged in the FEIS. I provide this information to elucidate important technical issues and to identify key factors and impacts that were not adequately considered and explained in the FEIS.

12. The FEIS fails to reasonably disclose the overall direct effects of Alt. 2 on erosion and sediment delivery to streams, because it omits a quantitative assessment of the effects of several activities under the action alternatives that would persistently elevate erosion and sediment delivery to streams. The activities omitted from analysis include firelines, pile burning, broadcast burning, logging, and landings. The FEIS also fails to reasonably assess the cumulative effects of the action alternatives at the watershed scale, combined with those of livestock grazing, on erosion and sedimentation.

13. These significant defects are exacerbated by the FEIS's failure to adequately divulge that the FEIS's analysis indicates the some action alternatives would almost double cumulative erosion from existing roads, on average, for five years, relative to existing conditions. The FEIS also fails to reasonably reveal that it is highly likely that several of the action alternatives would cumulatively increase total erosion from roads over a 10-20 year period, contrary to the incorrect statements in FEIS.

14. The FEIS fails to adequately divulge that the use of wet roads under the action alternatives would exacerbate the impacts of the road network on erosion and sediment delivery.

15. The FEIS fails to reasonably note that its own analysis indicates that the action alternatives effects on road erosion, alone, would double watershed-scale background erosion rates for several years. The FEIS fails to reasonably divulge that available scientific information clearly indicates that this level of increased erosion and sediment delivery from road impacts, alone, would significantly degrade aquatic systems in a variety of ways. The FEIS fails to properly note that this degradation from management-induced erosion and sediment is even more likely under the action alternatives due to additional impacts from other activities that would elevate erosion.

16. The FEIS fails to adequately incorporate into its analysis available information that more than amply indicates that the magnitude of elevated erosion caused by the total effects

of the action alternatives on erosion and sediment delivery to streams would include significant increases in suspended sediment and turbidity, increases in fine sediment in stream substrate, increases in width/depth ratio, loss of pool quality and volume. Notably, elevated width/depth ratios would increase summer high water temperatures, even in the absence of shade loss. The FEIS fails to properly discuss that this degradation of steelhead and salmon habitats would reduce the survival and production of those fish.

17. The FEIS fails to make known that the action alternatives' impacts would negatively affect several stream attributes that serve as PACFISH Riparian Management Objectives (hereinafter: "RMOs"), especially pools, width/depth, and water temperature. The FEIS also fails to divulge the existing width/depth ratio conditions in streams within the Project area and properly assess compliance with PACFISH RMO targets for this attribute. Therefore, the FEIS does not adequately assess the consistency of the alternatives with the UNF Plan, as amended by PACFISH.

18. Fine sediment levels in streams affected by the Project profoundly affect salmonid survival and production and will be affected by Alt. 2. However, the FEIS provides no quantitative information on current fine sediment conditions in these streams.

19. The FEIS's treatment of the issues related to fuels and potential effects on fire has numerous significant defects. The FEIS fails to reasonably discuss and incorporate into its analysis peer-reviewed scientific information that indicates the FEIS's assessments of potential changes in forest structure and fire behavior are likely in error. The FEIS fails to reasonably note that fuel reduction treatments are ineffective in altering fire behavior and inconsistent with restoration in many forest types where treatments would occur under the action alternatives.

20. The EIS fails to reasonably divulge the transience of fuel reduction treatments. The FEIS incorrectly asserts that activities under the action alternatives might affect the fuels and fire for 20 to 30 years, however data and scientific consensus indicate that fuels that affect fire rebound to pretreatment levels within 10-15 years of treatment, at most.

21. The FEIS fails to properly assess and discuss the very small likelihood that fuel treatments could potentially affect fire behavior, although this is easily estimated from data in the

FEIS. Similarly, the FEIS fails to properly assess and discuss the likelihood that activities under the action alternatives would increase fire spread and severity, although this is also easily estimated from data in the FEIS. The FEIS also fails to properly assess and discuss the small risk of fire under the No Action Alternative although this too can be easily estimated. The FEIS also failed to properly assess and discuss the many beneficial impacts of fire on aquatic systems. Due to these defects regarding fuels and fires, the FEIS fails to adequately differentiate among the alternatives or reasonably ascertain their consistency with the stated purpose and need for the Project.

The FEIS fails to reasonably estimate all of the effects of erosion and sediment delivery from all activities under the action alternatives.

22. The FEIS only provides some estimation of changes in road erosion over five years, while failing to include quantitative estimates of several activities under the action alternatives that will affect significant areas and are known to persistently elevate soil erosion and subsequent delivery to streams. Such activities omitted from analysis include firelines, pile burning, broadcast burning, logging, and landings.

Firelines

23. Firelines plainly greatly elevate erosion in a persistent fashion, although this is not quantitatively included in the estimate of erosion effects of the alternatives in the FEIS. As we noted in Beschta et al. (2004):

“Whether built by hand or machinery, these firelines involve soil disturbance and the removal of vegetation and litter. This can increase surface runoff, erosion, and sediment delivery to streams as well as facilitate noxious weed invasions (Kattleman 1996). Firelines constructed by bulldozers are of greatest concern because of their width (up to 15 m) and the severity of soil disturbance and compaction. Firelines in riparian areas contribute to aquatic degradation by reducing large wood recruitment, bank stability, and stream shading, while increasing sediment delivery to streams. Although handlines are typically narrower and involve less severe impacts than bulldozer lines, negative effects can be substantial, especially in areas that are highly susceptible to erosion.”

24. A copious amount of firelines would be created under the action alternatives. Alt. 2 would create 44 miles of firelines, including in Riparian Habitat Conservation Areas (RHCAs)

near streams (FEIS, pp. S-10, S-13 to S-14). Firelines constructed in close proximity to streams in RHCAs will elevate sediment delivery to streams, as previously noted. However, despite the magnitude, location, and known impacts of firelines, the FEIS does not include a quantitative assessment of the effects of firelines on soil erosion and sediment delivery under the action alternatives

Broadcast burning

25. Available data plainly indicate that broadcast burning increases soil loss and sediment delivery to streams, sometimes severely, for several years (Megahan et al., 1995; Rhodes, 2007;¹ Rhodes and Baker, 2008), although this is not adequately noted in the FEIS. Broadcast burning persistently increases in erosion and sediment delivery by removing soil cover and altering soil properties. This burning often involves high severity burns that sometimes reduce infiltration rates by causing hydrophobic soils that elevate runoff and erosion (Robichaud, 2000, Rhodes, 2007). USFS researcher Robichaud (2000) documented that broadcast burning reduced infiltration rates by about 10-40% over a significant portion of the burned area. Debyle (1973) also documented the development of hydrophobic soils from post-logging broadcast burning.

26. Megahan et al. (1995) documented that broadcast burning after logging increased surface erosion by about **66 times** relative to that on undisturbed slopes, approximately doubling sediment yield from the affected watershed for about 10 years. High levels of bare soils persisted 10 years after broadcast burning (Megahan et al., 1995). For these reasons, Megahan et al. (1995) recommended avoidance of broadcast burning where soil loss was a significant concern. Therefore, it is clear that broadcast burning significantly increases soil erosion and sediment delivery to streams.

27. Notably, a considerable amount of broadcast burning would occur under the action alternatives. Under Alt. 2, about 2,180 acres, or more than 3.4 square miles would be broadcast burned (FEIS, pp. S-10, S-13 to S-14). This burning would likely affect riparian areas

¹ Rhodes (2007) was submitted to the UNF by the Blue Mountain Biodiversity Project as part of its comments on the Project.

in close proximity to streams (FEIS, p. 98). There is also the considerable potential for prescribed broadcast burning to burn hotter and over much greater areas than expected: the large Cerro Grande fire in New Mexico started as a prescribed burn and greatly elevated erosion in areas burned at high severity (Rhodes, 2007).

28. However, the FEIS does not include a quantitative estimate of the effect of broadcast burning on erosion and sediment delivery in its analysis of the overall impacts of the action alternatives. This is despite the considerable extent of burning under the action alternatives and its documented effects on erosion and sediment delivery.

Pile burning and machine piling

29. Pile burning greatly increases soil erosion in several ways, although this is not adequately disclosed in the FEIS. Pile burning removes organic matter and nutrients, sterilizing soils beneath the piles (Kauffman 2004; Korb et al., 2004). The soil damage under burned piles is so intense and enduring that burn scars remain persistently unvegetated or occupied only by exotic, and often invasive, weeds (Korb et al., 2004), as shown in Figures 1a and 1b attached to this declaration. The resulting damage to soils greatly reduces infiltration and increases runoff. These combined impacts persistently elevate soil erosion.

30. Machine piling associated with pile burning has additional severe impacts on soils via compaction, soil disruption, and removal of vegetation and groundcover. On a per unit area basis, the soil disturbance caused by impacts of machine piling are only rivaled by the construction of roads and landings (Geppert et al., 1984; Menning et al., 1996). Much of the displaced topsoil displaced by machine piling ends up underneath the piles, where it is exposed to high temperatures when piles are burned, severely damaging the affected soils (See photos 1a and 1b attached to this declaration). The piling itself, when done by ground-based machinery negatively affects a much larger area than the piles, contributing to persistent increases in surface erosion and sediment delivery due to soil baring, displacement, compaction, and elevated surface runoff. These aggregate impacts of machine piling add to elevated soil erosion impacts from pile burning.

31. The Project action alternatives propose high levels of pile burning. For instance, 726 acres, or more than 1.1 square miles, would be subjected to pile burning under Alt. 2. Using the cumulative impact methods used in Region 5 of the USFS (Menning et al., 1996),² this level of pile burning would be equivalent to the impact of about **45 additional miles of roads** with a mean width of 20 feet within the Project area. An undisclosed amount of machine piling will occur under the action alternatives (FEIS, p. 76). Therefore, piling and pile burning under the action alternatives will greatly elevate soil erosion and subsequent sediment delivery in an enduring manner.

32. Despite the considerable extent of piling and pile burning proposed under the action alternatives and its pronounced and enduring effect on soil erosion, the FEIS fails to include a quantitative estimate of the effect of pile burning on erosion and sediment delivery in its analysis of the impacts of action alternatives on erosion and sediment delivery to streams. Therefore, the FEIS fails to analyze the total impacts of the action alternatives on erosion and sediment delivery.

Landings

33. Although it is not adequately discussed in the FEIS, landings persistently elevate erosion and sediment delivery in a matter akin to roads. Although roads are typically the single largest source of elevated erosion in forested watersheds subjected to logging, landing impacts are similar in magnitude and persistence to those from roads on a per unit basis, including effects on soils, watershed hydrology, erosion and sediment delivery (Geppert et al., 1984, Menning et al., 1996; Beschta et al. 2004). Ketcheson and Megahan (1996) found that the longest travel distance of sediment from forest disturbances originated from a landing. USFS cumulative effects methods indicate that landings contribute to adverse watershed cumulative effects as persistently and significantly as roads on a per unit basis (Menning et al., 1996).

² USFS and USBLM, 1997c, Chapter 3, Effects of proposed alternatives on aquatic habitats and native fishes, in Evaluation of EIS Alternatives by the Science Integration Team. Vol. I PNW-GTR-406, USFS and USBLM, Portland, OR, notes that the approach in Menning et al. (1996) regarding the risks to watersheds from sedimentation from roads, logging activities, and grazing, were consistent with the authors' assessments of the risks from these activities.

34. The FEIS fails to reveal the area that would be affected by landings under the action alternatives, although landings are an inextricable component of logging activities, such as those proposed under the action alternatives. Available data (Rhodes, 2007) indicate that landings typically affect about 2% of the area affected by tree removal. Based on this information and the 2,502 acres of logging proposed under Alt. 2, about 25 acres would be affected by landings under Alt. 2. This is roughly equivalent to the impacts of about 10.3 miles of road with a mean width of 20 feet. This is quite significant due to the persistent and major impacts on erosion and sediment delivery.

35. Although landings under the action alternatives will have pronounced and enduring effects on soil erosion and sediment delivery, the FEIS fails to include a quantitative estimate of the effect of landing construction, reconstruction, or use on erosion and sediment delivery in its analysis of the impacts of action alternatives. Therefore, it is clear that the FEIS fails to analyze the cumulative impacts of the action alternatives on erosion and sediment delivery.

Logging and thinning

36. It is well-documented that logging significant increases soil erosion and sediment delivery for several years due to its impacts on soils and vegetation (e.g., Geppert et al., 1984; USFS et al., 1993; Rhodes et al., 1994; USFS and USBLM 1997a; b; c). Although undisclosed in the FEIS, the USFS's own broadscale assessment (USFS and USBLM, 1997c) of management impacts on national forests, including the UNF, concluded that logging inevitably contributes sediment to streams no matter how carefully it is conducted. "Thinning" involves many impacts to soils and vegetation that are similar to those from logging (Rhodes, 2007; Rhodes and Baker, 2008). Therefore, it is quite clear that logging and thinning would elevate erosion and sediment delivery to streams in the Project area under the action alternatives.

37. PACFISH RHCAs are not completely effective in preventing the elevated sediment from logging and thinning from reaching streams. Although the USFS and USBLM (1997a) assessment concluded that 300-foot buffer (RHCAs) widths from the edge of streams can effectively reduce, but not *eliminate*, sediment delivery from logging activities, PACFISH

RHCA widths are far less than 300 feet in width on many streams. On non-fish-bearing perennial and intermittent streams, RHCAs only extend 150 feet and 100 feet, respectively, from the edge of these streams. Although undisclosed in the FEIS, the USFS and USLM (1997a) noted that these smaller streams with RHCAs that extend less than 200 feet under PACFISH:

a) are more affected by sedimentation from sediment production from upslope activities than larger streams (pp.1365 to1366);

b) are a primary source of sediment supplied to fish bearing streams (p. 1366);

c) typically comprise the majority of the channel network and “...therefore strongly influence the input of materials to the rest of the channel system.” (p. 1366); and

d) are highly vulnerable to the impacts of upslope activities, because the likelihood for discernible instream effects increases with slope steepness and the erodibility of sideslopes (p. 1367); these smaller headwater streams tend to have steeper and more erodible sideslopes (p. 1371).

38. USFS and USBLM (1997a) clearly noted that RHCAs that extend more than 300 feet from the edge of streams are not always completely effective in preventing the elevated sediment from logging and thinning from reaching streams. The FEIS fails to reveal that the USFS and USBLM (1997b) included methods to expand RHCA widths based on slope steepness, in order to provide more protection from sediment delivery to smaller streams (USFS and USBLM, 1997b). These methods result in RHCA widths significantly greater than PACFISH RHCAs for intermittent streams with adjoining slopes greater than about 15%.

39. Logging and thinning would affect a considerable area under the action alternatives. Under Alt. 2, thinning and logging would occur on 7,735 acres, or more than 12 square miles within the Project area (FEIS, pp. S-13 to S-14).

40. Although logging and thinning under Alt. 2 would plainly affect a large area and have significant effects on soil erosion and sediment delivery, the FEIS fails to include a quantitative estimate of these impacts on erosion and sediment delivery in its analysis of the impacts of the action alternatives. Thus, the FEIS fails to analyze the total impacts of the action alternatives on erosion and sediment delivery.

Failure to reasonably differentiate among the alternatives with respect to impacts on erosion and sediment delivery

41. There are considerable differences among the alternatives in the amount of piling, pile and broadcast burning, firelines, thinning, logging, and landings (FEIS, pp. S-13 to S-14). Therefore, the failure to include estimates of the effects on erosion and sediment delivery from these activities causes the FEIS to fail to reasonably differentiate among the alternatives.

The FEIS fails to reasonably estimate cumulative effects on erosion and sediment delivery from all activities under the action alternatives in combination with past and on-going livestock grazing.

42. Legions of studies have documented that livestock grazing very significantly increases sediment delivery to streams via several mechanisms (Rhodes et al., 1994; Beschta et al., 2004). For instance, the USFS's Interior Columbia Basin Ecosystem Project: Scientific Assessment, Vol. 3, Chapter 4, Broadscale Assessment of Aquatic Species and Habitat³ (p. 1009) states:

“Grazing is a major nonpoint source of channel sedimentation (Dunne and Leopold 1978; MacDonald and others 1991; Meehan 1991; Platts 1991). Grazed watersheds typically have higher stream sediment levels than ungrazed watersheds (Lusby 1970; Platts 1991; Rich and others 1992; Scully and Petrosky 1991). Increased sedimentation is the result of grazing effects on soils (compaction), vegetation (elimination), hydrology (channel incision, overland flow), and bank erosion (sloughing) (Kauffman and others 1983; MacDonald and others 1991; Parsons 1965 Platts 1981a, 1981b; Rhodes and others 1994). Sediment loads that exceed natural background levels can fill pools, silt spawning gravels, decrease channel stability, modify channel morphology, and reduce survival of emerging salmon fry (Burton and others 1993; Everest and others 1987; MacDonald and others 1991; Meehan 1991; Rhodes and others 1994)...Compared to ungrazed sites, aquatic insect communities in stream reaches associated with grazing activities often are composed of organisms more tolerant of increased silt levels, increased levels of total alkalinity and mean conductivity, and elevated water temperatures (Rinne 1988).”

43. Almost all of the Project area is affected by livestock grazing (FEIS, p. 96). It is well-documented that livestock grazing has considerable impacts on erosion and sediment

³ This USFS and USBLM assessment of land management impacts included the UNF.

delivery, particularly in riparian areas near streams. In watersheds that are extensively grazed by livestock, the effect on erosion and sedimentation at the watershed scale is often as great as or greater than that from roads (Rhodes et al., 1994; Rhodes, 2007).

44. The FEIS repeatedly (e.g., pp. 90, 102) acknowledges that past⁴ and on-going livestock within the Project area has significantly affected stream banks, riparian areas, soil erosion and sediment delivery. However, the FEIS does so without any adequate quantitative assessment of the effects of past and on-going livestock grazing within the Project area in combination with the total impacts of the action alternatives on erosion and sediment delivery. Despite the acknowledgement that livestock grazing has significantly affected erosion, sediment delivery in ways that have degraded salmonid habitats, and PACFISH RMOs for width/depth ratio, water temperature, and bank stability (FEIS, pp. 90, 102), the FEIS still clearly fails to reasonably estimate the overall effects on erosion and sediment delivery from all activities under the action alternatives in combination with past and on-going livestock grazing.

45. This is a very significant omission due to the scale and likely magnitude of the effects of livestock grazing on erosion and sediment delivery within the Project area. Cumulative sediment delivery greatly affects water quality and stream conditions, including those that greatly affect the survival and production of steelhead and salmon (Richards, 1982; Lisle and Hilton, 1992; USFS et al., 1993; Rhodes et al., 1994; Lisle et al., 1993; McIntosh et al., 2000; Hassan and Church, 2000; Buffington et al., 2002; Kappesser, 2002). Therefore, reasonable assessment of likely cumulative impacts on aquatic conditions and populations, including steelhead and salmon, requires assessment of cumulative sediment delivery at the watershed scale. This is plainly lacking in the FEIS.

The FEIS fails to reasonably disclose that the estimated effects of road activities on erosion under several of action alternatives indicate that road erosion will be significantly increased relative to existing conditions for more than five years.

⁴ The FEIS (p. 90) notes “Intensive livestock grazing before the 1950s still is affecting sediment transport as a result of stream bank and channel destabilization that has not recovered fully.”

46. These foregoing significant defects of omission in the FEIS regarding the action alternatives' impacts on erosion and sediment delivery are exacerbated by the FEIS's failure to reasonably reveal that the analysis in the FEIS indicates that the action alternatives would greatly increase erosion from existing roads, in a cumulative fashion over a five year period, relative to existing conditions. Based on the estimated erosion under existing road conditions and the effects action alternatives (FEIS, p. 87, Figure 3.4.1), for example, Alt. 2 would cumulatively elevate erosion from the road system by about 72% over the course of five years, relative to the already elevated level estimated under existing conditions. This is not adequately divulged in the FEIS.

47. The FEIS only notes that Alt. 2 would greatly increase road erosion for several years, but then result in some small reductions in road erosion thereafter (FEIS, p. 86). The FEIS does not disclose or analyze the overall impacts of the effects of the alternatives on erosion from roads over the five year period for which it estimates road erosion.

48. Even if a longer timeframe of 20 years is examined, the information in the FEIS on road erosion under the alternatives (FEIS, p. 87, Figure 3.4.1) together with available information from methods of the USFS for estimating the effects of road activities under the alternatives (Potyondy et al., 1991; Menning et al., 1996), Alt. 2 would still cumulatively elevate road erosion by about 1% over that from existing conditions under the No Action Alternative.

49. Notably, the FEIS does not correctly reveal or analyze the overall impacts of the effects of the alternatives on erosion from roads over 20 years. Instead, the FEIS (p. 86) mischaracterizes impacts thusly: "Over the long term (5 to 30 years), the combination of road activities ... would result in a decline in road-related erosion and sediment production by about 14 - 17 percent compared to existing background conditions, at the watershed scale." However, the foregoing indicates that it is highly likely that the action alternatives will elevate road erosion over a 20-year time period, rather than reduce it relative to existing conditions, contrary to the statements in the FEIS.

50. This is not a surprising result. It is well-documented that road activities under the action alternatives (elevated traffic, reconstruction, construction) cause large and immediate

increases in erosion and sediment delivery from roads (Rhodes et al., 1994; Gucinski et al., 2000; Beschta et al., 2004). Efforts to reduce road erosion, including closures or obliteration, do not eliminate elevated erosion from roads. If effective, such treatments have relatively small effects that accrue slowly (Rhodes et al., 1994; Menning et al., 1996; Beschta et al., 2004). Therefore, attempts to reduce erosion from existing roads typically cannot offset the combined impacts of road construction, elevated road use, and re-opening. As we noted in Beschta et al. (2004) (emph. added):

“...Accelerated surface erosion from roads is typically greatest within the first years following construction although in most situations sediment production remains elevated over the life of a road (Furniss et al. 1991; Ketcheson & Megahan 1996). Thus, even “temporary” roads can have enduring aquatic impacts. Similarly, major reconstruction of unused roads can increase erosion for several years and potentially reverse reductions in sediment yields that occurred with non-use (Potyondy et al. 1991)...**the assumption that road obliteration or BMPs will offset the negative impacts of new road and landing construction and use is unsound since road construction has immediate negative impacts and benefits of obliteration accrue slowly.**”

The FEIS fails to reasonably disclose that action alternatives in conjunction with past and on-going grazing will elevate erosion and sediment delivery to levels that are about twice the natural background rate

51. Although it is not discussed in any detail in the FEIS, the analysis of erosion rates indicates that the action alternatives’ effects on road erosion, alone, would double watershed-scale background erosion rates for a few years. Under Alt 2, over five years, effects on road erosion, alone, would elevate it by about 43%, and likely more than 80%, nearly doubling the assumed natural background erosion rate, based on the estimated erosion information in the FEIS (p. 87, Figure 3.4.1).

52. However, the foregoing is based on the assumption in the FEIS that the natural background erosion rate within the Project area is about 6 tons per square mile or at the uppermost end of the likely range in the natural background erosion rate in the Project area (FEIS, p. 85). The FEIS (p. 84) notes that actual natural background erosion within the Project area is likely believed to be within the range of 1-6 tons per square mile. Assuming that this range in the natural background erosion rate is correct, it is likely that the actual background

erosion rate is 1 or 3 tons per square mile, rather than the 6 tons per square mile assumed, without any supporting rationale whatsoever, in the FEIS (p. 85). Therefore, it is just as likely that the effects of Alt. 2 on road erosion, alone, would more than double or triple the natural background erosion rate. However, no such acknowledgement is made in the FEIS.

53. This magnitude of increased erosion and sediment delivery under Alt. 2 relative to natural background rates is still larger than that indicated in the FEIS regarding the effects from road erosion alone. As previously discussed, Alt. 2 includes several other activities besides road activities that will significantly and persistently elevate erosion and sediment delivery. These activities include piling, pile and broadcast burning, landings, logging, thinning, and firelines.

54. Past and on-going livestock grazing occurs over most of the watershed and has affected streams and riparian areas. Based on available information, together with the scale and location of past and on-going livestock grazing, it is likely that the impacts of this grazing on erosion and sediment delivery in the Project area approaches or is equal to that from the existing road network.

55. For these combined reasons, it is likely that the cumulative effects of Alt. 2 in combination with on-going grazing would more than double the natural background rate of erosion and sediment delivery at the watershed scale within the Project area for a considerable duration. However, the FEIS is devoid of any adequate admission of this magnitude of cumulative alteration in erosion and sediment delivery in the Project area under Alt. 2.

56. Contrary to the mischaracterization of these major changes in erosion and sediment delivery within the Project area in the FEIS, the magnitude and duration of this increase in erosion and sediment delivery is well outside the range of natural variability. Natural disturbances, such as fire, only produce short-term and quite infrequent spikes in erosion and sediment delivery (Rhodes, 2007). In contrast, the action alternatives together with existing conditions and ongoing activities would persistently and significantly increase sediment delivery in a manner that in no way comports with natural variability. There is no plausible scenario for natural disturbances that would produce the level and duration of cumulative erosion and sediment delivery under the action alternatives. Notably, the chronic elevation of sediment

delivery under the action alternatives has more significant negative impacts on salmonids than the infrequent, patchy and transient effects of natural disturbances (Gresswell, 1999; Rieman et al., 2003; Rhodes, 2007).

57. These are severe defects, because, as will be discussed in greater detail, the near doubling of sediment delivery for five years from road impacts, alone, under Alt. 2 would degrade water quality and stream conditions in a variety of ways that reduce the survival and production of steelhead and salmon. The FEIS fails to reasonably divulge that this degradation from management-induced erosion and sediment is even more likely under the Alt. 2, because of piling, landings, broadcast and pile burning, logging, thinning, firelines, and past and ongoing livestock grazing all of which would also greatly contribute to elevating erosion and sediment delivery beyond that caused by road activities.

The FEIS fails to reasonably disclose that the road maintenance activities and the use of wet roads under the action alternatives would increase the impacts of the road network on erosion and sediment delivery to streams.

58. The action alternatives all plainly involve significant amounts of road maintenance, including blading, vegetation removal, and ditch cleaning (FEIS, p. 86). Studies have repeatedly documented that these activities elevate erosion and sediment delivery from roads, although this is not adequately revealed in the FEIS. Black and Luce (1999) found grading of roads elevated sediment production for at least a year. Luce and Black (2001) documented that ditch maintenance also elevated erosion. Sugden and Woods (2007) documented that blading significantly increases sediment delivery from roads. Instead of properly revealing these impacts of blading and ditch cleaning, the FEIS (p. 86) mischaracterizes these impacts by stating that road maintenance activities: "...can be expected to reduce road-derived erosion and sediment transport for 3 to 5 years...."

59. Haul on wet roads negates or greatly reduces the effectiveness of efforts to limit sediment delivery from roads. Haul on wet roads often destroys or damages drainage features, such as water bars, put in place on roads to limit road runoff concentration and consequent

erosion and sediment delivery. It also reduces the effectiveness of surfacing with aggregate or lifts of rock on the road surface.

60. The work of USFS researcher Reid (1998) documented that the use of graveled roads during wet weather significantly increased instream turbidity from elevated road erosion. Wet weather haul causes rutting, documented by USFS research to increase sediment delivery from surface erosion on roads by about 2-5 times that occurring on unrutted roads (Burroughs, 1990; Foltz and Burroughs, 1990). Gucinski et al. (2001) noted in a USFS compendium of the impacts of roads, "As storms become larger or soil becomes wetter, more of the road system contributes water directly to streams."

61. The ruts on roads increase sediment delivery from roads for as long as the ruts persist. Road ruts typically persist until the road surface is treated, by reconfiguring the surface of the entire travelway of the road with heavy earth-moving machinery. Although this treatment is often used to obliterate ruts, this reconfiguration of the surface layer of the road also increases sediment delivery from roads (Rhodes, 2007). Thus, rutting of roads by haul when roads are wet significantly increases sediment delivery from roads, even if the ruts are ultimately treated. Although undisclosed in the FEIS, USFS research (Burroughs, 1990) concluded that road closure when roads are wet is one of the most important measures to reduce sediment production from roads and damage to roads.

62. The action alternatives will plainly involve road use on wet roads. The FEIS (p. 50) clearly notes that water will be withdrawn from streams and applied to roads for dust abatement under the action alternatives.

63. Despite the well-documented effect of road use on wet roads, the FEIS does not reveal that the proposed application of water to roads for dust abatement will increase erosion and sediment delivery from affected roads. There is also no indication in the FEIS that the effect of the use of wet roads on erosion and sediment delivery under the action alternatives was factored into estimates of the effects of the action alternatives on road erosion in the FEIS.

The FEIS fails to adequately divulge that the level of cumulative erosion and sediment delivery under the action alternatives, in combination with that from past and on-going grazing, will degrade habitat conditions that affect salmon and steelhead survival and production

64. Available information amply indicates the doubling to tripling of natural erosion and sediment delivery levels would degrade water quality and fish habitat conditions in a variety of ways. It would significantly increase suspended sediment and turbidity (Rhodes et al., 1994; Reid, 1998; Purser et al., 2009), although the FEIS fails to adequately reveal this. Elevated turbidity is known to adversely affect salmonids, water quality, and water resources, as USFS research has acknowledged (Rhodes et al., 1994; Reid, 1999).

65. The cumulatively elevated sediment delivery would also increase fine sediment levels in stream substrate, as field and laboratory studies have repeatedly documented (Lisle and Hilton, 1992; USFS et al., 1993; Rhodes et al., 1994; Lisle et al., 1993; Hassan and Church, 2000; Buffington et al., 2002; Kappesser, 2002). Increases in fine sediment in streams greatly decrease the survival and production of salmonids in a variety of ways (e.g., see reviews in Meehan, 1991; Rhodes et al., 1994; Waters, 1995; USFS and USBLM, 1997a). Bull trout and cutthroat trout undergo especially sharp drops in survival with increased levels of fine sediment (Weaver and Fraley, 1991; USFS and USBLM, 1997a), although the FEIS fails to adequately disclose this. Suttle et al. (2004) documented that any elevation of fine sediment levels reduces steelhead production.

66. The FEIS also fails to reasonably reveal that the cumulative doubling or tripling of erosion and sediment delivery under the action alternative for at least 10 years would contribute to loss of pool quality and volume (Lisle and Hilton, 1992; USFS et al., 1993; McIntosh et al., 2000; Buffington et al., 2004). It has been repeatedly concluded that elevated sediment delivery from roads, logging, and grazing, is a major cause of documented, large-scale losses in large pools on streams draining national forest lands (USFS et al., 1993; McIntosh et al., 2000), although this is not adequately revealed in the FEIS.

67. Increases in sediment delivery inevitably results in increases in width/depth ratio (Richards, 1982; Rhodes et al., 1994). Elevated width/depth ratios increase summer high water

temperatures, even in the absence of shade loss (Bartholow, 2000). Notably, high summer water temperatures are already a significant water quality problem in some streams in the Project area (FEIS p. S-5).

68. The FEIS includes no hard look at these predictable impacts, although all would contribute to the degradation of steelhead and salmon habitats in ways that significantly reduce the survival and production of those fish (Meehan et al., 1991; USFS et al., 1993; Rhodes et al., 1994; USFS and USBLM, 1997a).

69. This is major defect because several of the affected stream attributes are PACFISH RMOs, including width/depth ratio, pools, and water temperature. The FEIS fails to adequately assess and reveal these obvious impacts on RMOs impacts under the alternatives.

70. The FEIS's assessment of the impacts of the action alternatives impacts on erosion and sediment delivery and resulting aquatic impacts, including those to water quality, critical elements of salmonid habitats, streams, and salmonid populations, fails to reasonably address the large and persistent overall increases in erosion and sediment that will occur under the action alternatives. Instead of properly scrutinizing and assessing these impacts, the FEIS (p. 90) grossly mischaracterizes the nature of the increases in erosion and sediment delivery under the alternatives, thusly: "In the short term, effects of project activities on erosion and sediment for all alternatives would be small, localized, and generally indistinguishable from background and within the range of natural variability." This statement is demonstrably false. The doubling to tripling of erosion and sediment delivery relative to natural levels for several years would be easily detectable using standard monitoring methods. In fact, much smaller and less persistent changes in erosion and sediment delivery have repeatedly been detected and distinguished from natural background erosion and sediment delivery (e.g., reviews in Rhodes et al., 1994; Rhodes, 2007).

71. The persistent major elevation of erosion and sediment delivery under the alternatives will be well outside of natural variability, particularly with respect to its persistence. There is no plausible scenario under which natural disturbances would significantly and consistently elevate erosion and sediment delivery for 10-20 years, as will occur in the Project

area under the action alternatives. The FEIS also fails to reasonably reveal that the persistent chronic elevation of erosion and sediment delivery by roads and grazing under the alternatives have more negative impacts on salmonids than the infrequent, transient impacts of natural disturbances.

72. These defects are exacerbated by the FEIS's failure to divulge the existing width/depth ratio conditions within the Project area and level of compliance with PACFISH RMO target for this attribute. Therefore, the FEIS does not reasonably assess consistency of Project alternatives with the UNF Plan as amended by PACFISH.

73. Similarly, although fine sediment levels in streams profoundly affect salmonid survival and production, the FEIS provides no information on current fine sediment conditions in streams that would be affected by action alternatives. The FEIS (p. 100) refers to fine sediment data in a table that is not in the FEIS. However, even if this data were included, it is stale and not ample for assessing and revealing the existing conditions, because the FEIS (p. 100) states that the fine sediment data missing from the FEIS was collected more than 16 years ago. The reasonable assessment of the impacts of activities on fine sediment levels requires assessment of existing fine sediment conditions (Rhodes et al., 1994). Therefore, the FEIS fails to reasonably assess impacts on fine sediment conditions under the action alternatives and resulting impacts on salmonids.

The FEIS fails to reasonably discuss peer-reviewed scientific information that indicates the FEIS's assessments of changes from historic forest structure and fire behavior are likely in error.

74. Although undisclosed in the FEIS, research has repeatedly established that many lower elevation, drier ponderosa pine stands have been prone to some level of stand-replacing fires and have not been significantly altered by fire suppression (Veblen, 2003; Romme et al., 2003a; b; Rhodes, 2007). Therefore, the drier forest types proposed for treatment under the action alternatives may not be altered and may not benefit from any sort of forest treatments aimed at reducing fuel levels, although this is not revealed in the FEIS.

75. By failing to reasonably analyze and disclose this available scientific information, the EIS has failed to reasonably disclose the limited veracity of its assessments and the current

level of scientific debate regarding the structure and fire behavior in dry forests in the Project area.

76. The FEIS fails to properly discuss and bring into the daylight other important scientific research regarding the likely veracity of the FEIS's assessment of alteration in natural fire regimes. The FEIS fails to reveal a significant body of work indicating that there is a considerable degree of uncertainty in estimating natural fire regimes, and, departures from them (e.g., Veblen 2003; Baker and Ehle, 2001; 2003; Kou and Baker, 2006a; b). Similarly, the FEIS completely fails to discuss the current scientific debate regarding reported natural fire regimes and reported fire return intervals (Veblen 2003; Baker and Ehle, 2001; 2003; Kou and Baker, 2006a; b). These are significant defects because the FEIS relies considerably on assumptions regarding natural fire regimes and departures from them in assessing the potential impacts of the alternatives on fire (FEIS, pp. 57-77).

77. The FEIS fails to mention that even with rigorous site-specific investigations of fire behavior over several centuries using multiple lines of evidence, fire regimes remain so uncertain that Veblen (2003) cautioned that "Mean fire intervals (both composite and individual tree intervals) have *an uncertain ecological meaning.*" (Emph. added). This is a significant failure, because the FEIS's assessment of the effects of the action alternatives on fire behavior relies on mean, or average, fire return intervals (FEIS, pp. 70-77) without disclosing the ecological meaninglessness of these metrics.

78. The FEIS (pp. 70-77) also significantly relies on the Fire Regime Condition Class (FRCC) assessment method and results to describe the existing conditions and effects of the alternatives in the Project area. However, the FEIS fails to adequately make known that FRCC has been shown to be a very poor indicator of fire severity when fire occurs (Odion and Hanson, 2006; Rhodes, 2007). In particular, the FRCC greatly overestimates the potential for higher severity fire when fire occurs (Odion and Hanson, 2006; Rhodes, 2007). Therefore, the FEIS fails to reasonably make known the very limited veracity of the FRCC assessments upon which it significantly relies.

The FEIS fails to adequately discuss and divulge that fuel reduction treatments are ineffective in altering fire behavior in forests with natural fire regimes dominated by infrequent, severe fire, which are the forest types where much of the purported fuel treatments would occur under the action alternatives.

79. The FEIS fails to sufficiently note that there is strong evidence that the “cold” and “moist” forest types proposed for treatments under the action alternatives (FEIS, pp. 70-77) have not been significantly affected by fire suppression, are not more prone to severe fire than historically, and that fire behavior in these forests are dominated by weather conditions rather than fuel conditions (Veblen, 2003; Romme et al., 2003 a; b; Rieman et al., 2003, Schoennagel et al., 2004; Noss et al., 2006; Rhodes, 2007; Rhodes and Baker, 2008).

80. There is strong and convergent lines of evidence that these forest types are prone to relatively infrequent, high-severity fires and that fuel conditions in these forest types are largely irrelevant to fire behavior, because fire behavior is primarily controlled almost solely by weather (Veblen, 2003; Romme et al., 2003 a; b; Schoennagel et al., 2004; Noss et al., 2006; Rhodes, 2007). In these forest types, fuel treatments are not consistent with the restoration of fire behavior, forest attributes, or fire regimes, and are largely futile with respect to reducing fire size and severity (Veblen, 2003; Romme et al., 2003 a; b; Schoennagel et al., 2004; Noss et al., 2006). However, the FEIS does not adequately discuss and divulge these findings and their ramifications.

81. Although the following is not mentioned in the FEIS,⁵ the Schoennagel et al. (2004) noted that in forests with natural fire regimes dominated by infrequent, high severity fire it is expected that fuel treatments are, “...generally unsuccessful in reducing fire frequency, severity, and size, given the overriding importance of extreme climate in controlling fire regimes in this zone.” The FEIS also fails to incorporate and discuss a key finding in Noss et al. (2006, emph. added) that with respect to fire, fuels, and forest structure “Restoration treatments are warranted...**only where such activities have resulted in major alterations in ecosystem**

⁵ The FEIS does not cite or discuss Schoennagel et al. (2004), although this paper provides a seminal distillation of how fire behavior and the effects of fuel treatments vary among forest types and fire regimes.

structure, function, or composition...Fire exclusion has had little effect on fuels or forest structure in forests characterized by high severity (stand replacement) fire.” Notably, many of the forest types that would be “treated” under the action alternatives are characterized by infrequent, high severity fire. Schoennagel et al. (2004) also noted that fuel treatments in these forests may do more harm than good, stating: “A ‘one-size-fits-all’ approach to reducing wildfire hazards in the Rocky Mountain region is unlikely to be effective and may produce collateral damage in some places,” although the FEIS does not discuss or substantively consider this salient finding with respect to the likely outcome from the action alternatives.

82. The failure of the FEIS to analyze and thoroughly discuss the foregoing is a major defect for several reasons. Under Alternative 2, a considerable amount of tree removal and fuel treatments would occur in forests with a fire regime of infrequent, high severity fire (FEIS, pp. 57-77). The FEIS has failed to clearly divulge that in these forests, there is strong scientific consensus that such treatments are highly unlikely to affect fire size or severity. In so doing, the FEIS has failed to adequately differentiate among the alternatives with respect to their environmental effects.

The EIS fails to adequately communicate the transience of fuel reduction treatments with respect to the effects of the alternatives

83. The FEIS fails to properly disclose that fuel treatments have a transient impact on fuel levels, which significantly limits potential effectiveness of treatments in reducing fire severity and size. Scientific literature, including that by USFS researchers, has clearly documented that fuels contribute to fire spread and severity begin to re-accumulate as soon as fuel treatments are completed, ultimately negating fuel treatment effectiveness (e.g., Graham et al., 2004; Kauffman, 2004; Rhodes and Baker, 2008). For instance, Baker et al. (2006) noted that thinning forests leads to renewed tree regeneration, leading to a need for renewed thinning, “...in a potentially endless, costly and futile cycle that does not restore the forest.”

84. Although it is not discussed in the FEIS, it is quite unlikely that a reduction in fuels can potentially affect fire behavior for more than 15 years after treatment (Graham et al, 2004; Agee and Skinner, 2004; Rhodes and Baker, 2008). For instance, Kiefer et al. (2006)

found that in ponderosa pine forests in the Sierra Nevada, California that 10 years after treatments, mean total fuel loads had nearly returned to pre-treatment levels.

85. In contrast, the FEIS incorrectly asserts that activities under the action alternatives might affect fuels and fire hazard for 20 to 30 years (FEIS, p. 74). Available information amply indicates that this is erroneous and implausible.

86. The negation of fuel treatment effectiveness by fuel re-accumulation is significant, because, if fire occurs after fuel levels have recovered, the treatments are likely to increase fire severity and impacts, although this is not adequately considered in the FEIS. In such a situation, fuel levels will be unchanged, while the canopy will remain more open than prior to treatments, which increases windspeed and decreases fuel moisture, both of which contribute to increased fire severity and flame lengths (Platt et al., 2006).

87. For these reasons, the EIS failed to adequately examine, discuss and substantively consider likely fire behavior as fuels re-accumulate in treated areas over time, due to the transience of the treatments on fuel levels and fire behavior. Due to these failures, the EIS does not adequately and reasonably differentiate among the alternatives.

The FEIS fails to reasonably disclose the probability of fire and the likelihood that fuel treatments could potentially affect fire behavior, although this is easily estimated from data in FEIS, which indicates that this likelihood is quite small.

88. The EIS never provides any reasonable assessment of the likelihood of fire occurring in the project area, although the EIS clearly premises much of the need for the project and the analyses of the alternatives' impacts on the supposed risk of fire. Such an analysis is critical because fire is not sure to affect treated areas while fuels are reduced, and if it does not occur, treatments cannot have any potential impacts on fire behavior that can compensate for the damage caused by fuel treatments and associated activities (Rhodes, 2007; Rhodes and Baker, 2008). It is critical to analyze and disclose the probability of fire in order to ascertain the risks of fuel treatment versus non-treatment (Agee and Skinner, 2005; Rhodes, 2007; Rhodes and Baker, 2008).

89. Similarly, if higher severity fire does not affect major portions of the Project area over the same time frame, the No Action alternative conveys little risk to affected resources and processes. Therefore, the occurrence of higher severity fire is a primary factor affecting the balance between treatment impacts and potential benefits, as well as the differences among alternatives (Rhodes, 2007; Rhodes and Baker, 2008).

90. Although the location, extent, and occurrence of higher severity fire cannot be accurately predicted (Graham et al., 2004), its extent and occurrence can be estimated in terms of probability. Notably, the data to estimate the likelihood of fire is plainly available in the FEIS and the task is eminently tractable. The EIS simply failed to include such an analysis.

91. As the FEIS notes, fire suppression has reduced the extent of fire occurrence over the past 70 years or so. Aggressive fire suppression in and around the Project area will continue in the future. Therefore, historical natural rates of wildfire occurrence plainly do not apply (Agee and Skinner, 2005; Rhodes, 2007; Rhodes and Baker, 2008). Instead, rates of wildfire occurrence under management that includes aggressive fire suppression are needed to reasonably estimate the risks of fire occurrence in the near future.

92. Fire suppression efforts had little effectiveness prior to the 1960s. Therefore, I used fire occurrence data for the Project area after 1960 to estimate the probability of fire in the project area. Using standard methods for estimating fire occurrence and resultant probability of (Baker and Ehle, 2001; Rhodes, 2007; Rhodes and Baker, 2008), the per acre probability that fire of any severity would affect areas that were not treated to reduce fuels under the No Action Alternative over the course of 15 years is only 5.7%. This simple and tractable estimate amply indicates that: a) the FEIS failed to reasonably assess the risk of fire occurrence under existing management despite the availability of data to do so; and b) the risk of fire occurrence within the Project area is quite low.

93. However, the foregoing is based on the risk of fire of any severity, which is not of particular interest, since low severity fire has primarily beneficial impacts, with negative impacts that are negligible and fleeting (Gresswell, 1999; Romme et al., 2003; Rhodes, 2007). Therefore, it is the risk of higher severity fire that is of interest. Data from multiple scales indicates that at

most only about 67% of areas burned by fire burn at higher severities (Rhodes, 2007; Rhodes and Baker, 2008). Therefore, the per acre probability of higher severity fire affecting untreated areas under the No Action Alternative is only about 3.8%. Plainly, available data indicates risk of higher severity fire occurring in the Project area is quite low under the No Action Alternative, although the FEIS fails to adequately consider and clearly discuss this. The FEIS predicates much of its analysis of the alternatives' impacts to soils, aquatics, endangered salmonids, streams, and water quality due to fire on the possibility of higher severity fire within the Project area. However it does so, in the absence of reasonable assessment of the actual risk of high severity fire. In so doing, the FEIS has failed to reasonably assess and discuss the alternatives' impacts to these resources and processes.

94. As previously discussed, the action alternatives will not reduce fuels for more than 15 years. Notably, the action alternatives will increase fuels for about five years (FEIS, p. 74). Thus, there is about a 10 year window in which the action alternatives will have reduced fuels.

95. Based on fire occurrence data from 1960-2008 in the FEIS, the probability that fire of any severity will affect treated areas with the 10-year period when fuels might be decreased by treatments, on a per acre basis is about 3.8%. The probability that higher severity fire will affect treated areas with the 10-year period when fuels might be decreased by treatments, on a per acre basis is about 2.5%. This plainly indicates that there is a very small likelihood that the action alternatives could potentially reduce fire severity and spread, even if they were completely effective when encountering fire. However, as previously discussed, available information plainly indicates that fuel treatments are primarily ineffective in the forest types in the Project area even if they do encounter fire.

96. Using this same straightforward approach, the likelihood that fire affects treated areas during the five years when the action alternative has increased fuels and is likely to increase fire spread and fire severity is about 1.9%. While relatively small, this indicates that the potential for the action alternatives to increase fire impacts and fire size is about half that of the probability that it might decrease these fire attributes. This simple and tractable estimate amply

indicates that the FEIS failed to reasonably assess the risk of fire occurrence in treated areas under Alt. 2 despite the availability of data to do so and its repercussions with respect to fire and its impacts on soils, streams, erosion, and affected salmonid populations.

The FEIS also failed to adequately discuss the many beneficial impacts of fire on aquatic and terrestrial systems and reasonably incorporate those into its assessment of the impacts of the action alternatives.

97. It is quite well documented that fire, even when severe, has numerous important beneficial impacts for forest ecosystems (Rieman et al., 2003; Lindenmayer et al., 2004; Beschta et al., 2004; Kauffman, 2004; Karr et al., 2004; Rhodes and Odion, 2004; DellaSala et al., 2006; Odion and Hansen, 2006; Baker et al., 2006; Rhodes et al., 2007; Rhodes and Baker, 2008). For instance, fire provides beneficial increases in the recruitment of terrestrial and aquatic large woody debris (LWD) (Beschta et al., 2004; Karr et al., 2004; DellaSala et al., 2006; Rhodes et al., 2007; Rhodes and Baker, 2008). This is a major benefit for aquatic systems and salmonids, including steelhead and salmon (Meehan et al., 1991; USFS and USBLM, 1997a; c). Terrestrial LWD is critical to forest soil productivity and provides important wildlife habitat (USFS and USBLM, 1997a; Lindenmayer et al., 2004; Karr et al., 2004; Beschta et al., 2004; Rhodes, 2007). Fire effects help rejuvenate aquatic systems and maintain or restore the complexity of aquatic habitats (Karr et al., 2004; Beschta et al., 2004; Rhodes, 2007; Rhodes and Baker, 2008).

98. Fire provides forest heterogeneity that is essential for biodiversity (Odion and Hanson, 2006; Rhodes, 2007; Rhodes and Baker, 2008). Fire also aids considerably in restoring the resiliency of forests with altered fire regimes (Kauffman, 2004; Baker et al., 2006; Odion and Hanson, 2006). As Odion and Hanson (2006) note regarding wildland fire:

“There may be no other effective strategy for restoring and maintaining ecological integrity and for fostering the natural diversity of species dependent on effects specific to fire. The structural modifications of forests cannot mimic the heterogeneous effects of fire. Instituting a policy that allows more fire to burn would require considerable planning and additional efforts to improve human safety, but such efforts are needed under any management scenario”

99. However, the FEIS fails to adequately divulge these benefits and adequately incorporate them in its assessments of the effects of the alternatives. In so doing, it has failed severely at assessing the alternatives' effects and adequately differentiating among the alternatives with respect to their effects on salmonids, water quality, soils, riparian conditions, streams, and wildlife.

Summary and Conclusions

100. The FEIS fails to reasonably assess and divulge the overall direct effects of Alt. 2 on erosion and sediment delivery to streams, because it omits a quantitative assessment of the effects firelines, piling, pile burning, broadcast burning, logging, and landings on erosion and sediment delivery. The FEIS also fails to reasonably assess the cumulative effects of the action alternatives at the watershed scale in combination with those of livestock grazing, on erosion and sedimentation.

101. The FEIS also fails to reasonably reveal that it is highly likely that several of the action alternatives would cumulatively increase total erosion from roads over a 10-20 year period, contrary to the incorrect statements in FEIS.

102. The FEIS fails to adequately divulge that road maintenance and the use of wet roads under the action alternatives would exacerbate the impacts of the road network on erosion and sediment delivery.

103. The FEIS fails to reasonably note that its own analysis indicates that the action alternatives' effects on road erosion, alone, would double watershed-scale background erosion rates for several. The FEIS fails to reasonably divulge that available scientific information clearly indicates that this level of increased erosion and sediment delivery from road impacts, alone, would significantly degrade aquatic systems in a variety of ways. The FEIS fails to properly note that this degradation from management-induced erosion and sediment is even more likely under the action alternatives due to additional impacts from other project activities that would elevate erosion.

104. The FEIS fails to adequately incorporate into its analysis available information that more than amply indicates that the magnitude of elevated erosion caused by the total effects

of the action alternatives on erosion and sediment delivery to streams would include significant increases in suspended sediment and turbidity, increases in fine sediment in stream substrate, increases in width/depth ratio, loss of pool quality and volume. The FEIS fails to properly reveal that this degradation of salmonid habitats would reduce the survival and production of those fish.

105. The FEIS fails to make known that the action alternatives' impacts would negatively affect several stream attributes that serve as PACFISH RMOs. The FEIS also fails to divulge the existing width/depth ratio conditions in streams within the Project area and properly assess compliance with PACFISH RMO target for this attribute. Therefore, the FEIS does not adequately assess the consistency of the alternatives with the UNF Plan, as amended by PACFISH.

106. However, the FEIS provides no quantitative information on current fine sediment conditions in these streams, although these conditions profoundly affect salmonid survival and production.

107. The FEIS fails to reasonably discuss and incorporate into its analysis peer-reviewed scientific information that strongly countermand the FEIS's assessments of potential changes in forest structure and fire behavior. The FEIS fails to reasonably note that fuel reduction treatments are ineffective in altering fire behavior and inconsistent with restoration in many forest types where purported fuel treatments would occur under the action alternatives.

108. The EIS fails to reasonably divulge the transience of fuel reduction treatments. The FEIS fails to properly assess and discuss the very small likelihood that fuel treatments could potentially affect fire behavior, although this is easily estimated from data in FEIS. The FEIS also fails to properly assess and discuss the likelihood that activities under the action alternatives would increase fire spread and severity. The FEIS also fails to properly assess and discuss the very small risk of fire under the No Action Alternative. The FEIS also failed to properly assess and discuss the many beneficial impacts of fire for forested ecosystems. Due to these defects regarding fuels and fires, the FEIS fails to adequately differentiate among the alternatives or reasonably ascertain their consistency with the stated purpose and need for the Project.

I declare under penalty of perjury that the foregoing is true and correct.

Executed this 11th day of September 2009 in Portland, Oregon.


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