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UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF CALIFORNIA
SACRAMENTO DIVISION

SIERRA NEVADA FOREST PROTECTION CAMPAIGN, *et al.*, Plaintiffs, vs. UNITED STATES FOREST SERVICE, *et al.*, Defendants, and QUINCY LIBRARY GROUP, an unincorporated citizens group; and PLUMAS COUNTY, Intervenors/Defendants.	Case No. Civ. S-04-2023 LKK/PAN SUPPLEMENTAL DECLARATION OF DR. DENNIS C. ODION IN SUPPORT OF PLAINTIFFS' MOTION FOR SUMMARY JUDGMENT Date: April 5, 2005 Time: 1:30 p.m. Judge: Hon. Lawrence K. Karlton

I, Dr. Dennis C. Odion, declare as follows:

1. In my professional capacity as an expert in fire ecology and vegetation science, I was asked by the plaintiffs in this case to evaluate the effects of the Meadow Valley Project. I provided a previous declaration because of my interests in community service and in encouraging the use of sound scientific principles in public land management. Here I provide a supplemental declaration to clarifying unresolved ecological considerations.

2 I preface my comments by briefly describing my qualifications. My areas of expertise are vegetation combustion, forest community redevelopment following fire, and disturbance ecology. My Ph.D research involved detailed instrumentation and monitoring of chaparral combustion and its subsequent redevelopment in relation to fire severity (Odion and Davis 2000). I have also done similar research in relation to fire and effects on rare plants (Odion and Tyler 2002), and have coauthored a review paper on fire intensity in chaparral vegetation (Borchert and Odion 1985). I monitored fires in forests in northern California for 5 years (e.g. Swezy and Odion 1998). I have also done research on fire severity patterns in forests in the Klamath region of northwest California (Odion et al. 2004a-b) and the Sierra Nevada Mountains (Odion and Hanson, in review), and I have recently done research on the non-native plant disease called Sudden Oak Death in relation to fire and forest composition (Moritz and Odion, in press). Finally, as a result of my university teaching experience I am an expert on California vegetation, such as forests of the Sierra. I previously conducted extensive field research on cattle grazing in the Sierra (Odion et al. 1988).

3. Many principles of vegetation combustion, vegetation ecology and disturbance ecology are universal, such as ecosystem resilience and resistance discussed below. I focus here on principles that govern these phenomena and draw upon primary scientific literature from the most credible sources for support of my statements. The documents supporting the proposed

Meadow Valley logging prepared by the Forest Service cite relatively little primary literature, and much of this is from relatively obscure forestry journals. They rely to a large degree on gray literature (government reports, proceedings, historical descriptions of questionable accuracy, etc.), rather than existing mainstream science.

4. The Forest Service documents supporting this project contend that logging 1-2 acre patches of ponderosa pines and other conifers is needed to provide for regeneration of more pines. While pine regeneration is an important process, no data are presented suggesting that pines in the stands proposed for logging are at risk of death and need to be replaced, or that they will not be replaced naturally as they have done for millennia when mortality does occur. Nor is there evidence presented that there is a regeneration crisis in ponderosa pine in general. Pines are regenerating in many cut over areas of the Sierra. Conversely, mature pines are believed to have been considerably reduced by logging. With an abundance of areas where pines have been cut already, it does not make sense to cut more pine in an attempt to reverse this problem. If a goal is to increase pines, the most effective approach would not be to cut vigorous existing pine stands, but to reestablish pines where they are missing, if such areas can be found. In addition, many of the logging units are located above 5,500 feet, or in mesic sites (i.e. relatively moist settings supporting more lush vegetation) where cutting forest would not naturally be followed by regeneration of ponderosa pine. The natural forest in these higher and/or wetter areas is dominated by white fir. Contrary to Forest Service claims, Weatherspoon (1996) does not recommend logging 1-2 acre patches in this vegetation.

5. Natural disturbances like fire, blowdown, and insect/disease outbreaks create openings for natural pine regeneration in suitable environments in the project area. While it is often suggested among advocates of forest cutting that logging can “mimic” natural disturbances, the

effects of fire and other natural disturbances are in fact very different from those of logging (Franklin et al. 2002). In particular, disturbances such as fire leave behind legacies upon which the new community reorganizes and redevelops (Paine et al. 1998, Franklin et al. 2002). For example, fires leave behind most pre-disturbance biomass in the form of dead trees, soil organic material, seeds, rhizomes, fungi, etc. As summarized in the figure below from White and Jentsch (2001), the amount of these legacies left after disturbance is a measure of the magnitude of the disturbance. Logging directly harvests legacies that would be left after fire, and ground-based machinery heavily disturbs soils and the abundant legacies contained there (seeds, fungi, etc). Thus, intensive logging, such as cutting nearly all the trees in a 1-2 acre patch, is at the other end of the disturbance magnitude spectrum from fire (horizontal axis in the figure below), even though fire may also create a 1-2 acre patch where most trees are killed. Ecological principles predict that a shift from an indigenous disturbance like fire to a higher magnitude non-indigenous disturbance that the biota have not evolved with will result in a reduction in biodiversity (Odion and Sarr, in review). A fire-killed patch of forest, with its rich array of standing dead trees and understory vegetation regenerated from seed banks stimulated by fire, and with large populations of fungi and arthropods that utilize woody debris, and a whole food chain supported by these, will tend to exhibit far greater biodiversity than a clear cut of the same size (Lindenmayer and Franklin 2002). In addition, the more highly disturbed area is more prone to exotic species invasion.

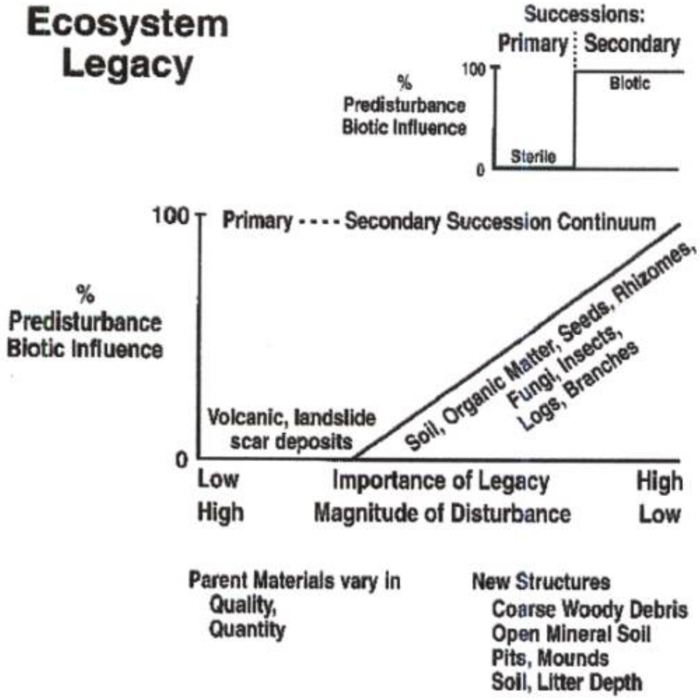

Fig. 7. The continuum from primary to secondary succession, based on ecosystem legacy and the effects of disturbance. The x-axis is a gradient of increasing ecosystem legacy and decreasing disturbance magnitude, and the y-axis represents the influence of the pre-disturbance ecosystem on recovery, from low (0%) to high (100%). The smaller diagram at the *upper right* presents the historical and overly simplified definition of primary (no influence of the pre-disturbance ecosystem) and secondary (100% influence) succession

6. By lifeboating species through disturbance and promoting diversity, pre-disturbance biological legacies confer ecosystem resilience to disturbance (Perry et. al. 1989). They allow the system to reorganize and redevelop and to eventually return to the pre-fire reference condition. These processes define ecological resilience (Holling 1973, Westman 1978, Connell and Sousa 1983, Malanson and Trabaud 1987, Halpern 1988, DeAngelis et al. 1989, Grimm et al. 1992; Jentsch et al. 2002, Folke et al. 2004). The reference condition includes the biodiversity that occurred prior to disturbance; so all the components of the forest are important for resilience of a forested ecosystem, not just economically valuable species. The Forest Service documents supporting this project cite increasing the resilience of forest vegetation as its main goal. However, there is no evidence presented suggesting the forests lack the ability to redevelop following natural disturbance. Russell et al. 1998 describe the redevelopment of forests after severe fire in mixed conifer forests of the Tahoe Basin in only 50-100 years. It is

probably impossible for forests to be more resilient due to the limitations on the rate of plant growth. Sierran forests are well adapted to fire disturbances, which have occurred for millennia (Stephenson 1999). It is not clear how the rate at which these forests are capable of restoring themselves after fire disturbance can be sped up to increase resiliency. Shifting to more intense disturbances that remove or impair most legacies, such as intensive logging where recovery will be impaired or lost, will reduce resiliency.

7. Another concern in terms of resilience results from the placement of slash on the ground as part of the logging operation. If this material burns, either intentionally as part of slash clean up, or unintentionally in a wildfire, it can be particularly damaging to soil. Moreover, it would result in successive, compounded disturbances (logging followed by fire with severe soil heating). Disturbances within the normative recovery time of a system are well known to lead to a persistent change to a different community state are an emerging environmental concern because many undesirable changes have resulted in many parts of the world (Paine et al. 1998, Odion and Sarr, in review). The new community is typically characterized by non-native species and lowered biodiversity. In sum, removing and impairing legacies and facilitating successive severe disturbances are actions that slow the potential return of forests and increase the likelihood for a shift to non-forest vegetation and exotics, which may persist (see figure 1 from previous declaration). This is consistent with findings that resiliency is reduced in proportion to the intensity of soil disturbance from logging, and that the effects of resulting shrub invasions are long-term (Halpern 1988).

8. The Forest Service implies that they will clean up slash and that very little will be generated anyway because whole trees will be transported to clearings outside the logged area. I have read the relevant documents from the EA, Decision Notice, Appeal Decision, and contract, and my understanding is that slash removal is only required within 50 feet of main roads and at

landings, but is otherwise not required by either the decision (which only mentions slash removal in 5-7 years in the *fuelbreak* units) or by the contracts (which specifically state that slash will be left up to a depth of 18 inches), and that whole tree transport is only required for trees under 20 inches in diameter. This is particularly significant because trees 20-30 inches in diameter will generate the majority of the slash since the amount increases rapidly with tree diameter. For example, the weight of slash generated by ponderosa pines whose diameter at breast height is 5, 10, 15, 20, 25, and 30 inches respectively is estimated as: 104, 470, 593, 844, 1250, and 1710 pounds respectively (Snell and Brown 1980).

9. Many of the areas proposed for overstory logging have recently been thinned and/or burned. To follow these treatments with a high magnitude disturbance such as the proposed logging would also create compounded disturbances. Loss of resilience due to compounded disturbances is counter to goals of increasing resilience. Moreover, the removal of forest undermines the goal of the original thinning and/or burning treatments--to allow forests to be largely unaffected by disturbance (i.e. to increase forest resistance). It does not make much sense to cut down a forest stand after considerable effort and expense had been outlaid in an attempt to make the forest more resistant to disturbance.

10. There was much disagreement among Sierra Nevada Ecosystem Project participants about how fire regimes have changed in the Sierra, in part because past conditions involve considerable uncertainty and were never the same at any two points in time (Stephenson 1999). Nonetheless, one key consensus conclusion of the SNEP Report (CWWR 1996) was that removal of overstory trees and other logging effects in the Sierra Nevada has increased fire severity and altered fire regimes more than any other factor. The behavior of the Cone Fire, invoked by the Forest Service to support an argument that logging is needed to reduce fire severity, appears instead to support the key SNEP concensus item. However, the Forest Service does not use the behavior of the Cone fire where it burned in overstory logged areas as an

example of how their proposed overstory logging may affect subsequent fire. Rather, they argue that lower intensity of the Cone Fire at the Black's Mountain Experimental Forest provides evidence in support of the Meadow Valley approach of logging overstory trees. The treatment effects at Black's Mountain to which they refer followed no such overstory logging. Instead, the Black's Mountain forests had been carefully thinned and burned to effectively eliminate surface fuels prior to the Cone Fire. This is an obvious apples to oranges comparison.

11. The use of the treatments at Black's Mountain Experimental Forest as an example of the effectiveness of treatments is also problematic because the effects of factors other than the treatments were not controlled for. The treated area was located in one location on the edge of the burn. Factors such as weather, topography, vegetation, etc. varied throughout the burned area. Not controlling for these factors in experimental design allows for no statistical inference regarding efficacy of fuel treatments (Rhodes and Odion 2004). It is equivalent in human terms to testing the effects of a medical treatment on one patient and trying to make inferences to a broad human population without controlling for age, health, lifestyle, etc. There are examples of the exact opposite phenomenon as occurred at Black's Mountain. For example, all of the 31 acres thinned prior to the 2002 McNally Fire in the southern Sierra burned at high severity even though only 12 percent high severity fire occurred in conifer forests throughout the fire, according to Forest Service data. Using the same logic applied to the Black's Mountain observation by the Forest Service, one would conclude that this means that thinning dramatically increased fire severity.

12. The Cone Fire and its behavior at Black's Mountain are also used by the Forest Service to make the argument that shrub vegetation that establishes following forest removal will not be particularly fire prone. Rather than citing fire behavior in shrub vegetation that

established following forest overstory removal prior to the Cone Fire, they use the example of newly regenerating shrubs in the understory of the forest at Black's Mountain. This is once again an apples to oranges comparison with no data provided. An assessment of how shrub vegetation that occupies forest openings burned is what is relevant to understanding the effects of the shrub invasion. Moreover, a scientific appraisal of the combustibility of chaparral vegetation that grows in forest openings would utilize the existing literature on this topic rather than rely on one anomalous circumstance.

13. What this literature indicates is that chaparral is one of the most fire-prone vegetation types on earth (Keeley 2000). Its dense, leathery leaved foliage can have very low moisture content, and is an explosive fuel due to its high surface to volume ratio, and chemistry (Rothermel and Philpot 1973, Odion and Davis 2000). The foliage contains far more high-energy chemical bonds than most vegetation, and there is consequently greater energy release per unit leaf area (Richards 1940, Rothermel and Philpot 1973). Many of these chemicals are volatized with little pre-heating, and the resulting vapors readily ignite. Although montane chaparral is less combustible than its better known southern California counterparts, landscape scale assessments of fire severity found that this vegetation exhibited substantially greater fire severity than associated forest vegetation (Odion et al. 2004). There is literature detailing the self-reinforcing relationship montane chaparral vegetation has with fire in the Sierra (e.g. Show and Kotok 1924, Wilken 1967). Wilken (1967) describes a stand of chaparral that established following logging in the mid-1800's, concluding that "the high fire factor in the area favors brush at the expense of tree growth." and that it "seems unlikely that this brush field will remain free of fire for sufficient time to permit natural forest regeneration." This is a perfect example of

long-term loss of forest resilience via the development of an alternative stable state (see Figure 1 from previous declaration).

14. In conclusion, landscapes in which fires have been suppressed do not "need" logging as an alternative to fire, especially where lots of logging has already occurred. The magnitude of logging disturbances is greater due to the removal of legacies, so ecosystems are not as resilient to these disturbances and may not recover to the same reference condition. From an ecological standpoint, natural disturbances, against which ecosystems are resilient, are important processes that help maintain species diversity. By suppressing these disturbances and introducing non-indigeneous, more severe ones, management lowers ecosystem resiliency and natural diversity. The Meadow Valley Project represents a continuation of this approach, rather than adaptive management.

Pursuant to 28 U.S.C. §1746, I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge. Dated this _______day of February, 2005.

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DENNIS C. ODION

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Pursuant to 28 U.S.C. §1746, I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge. Dated this 26th day of February, 2005.

DENNIS C. ODION

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